

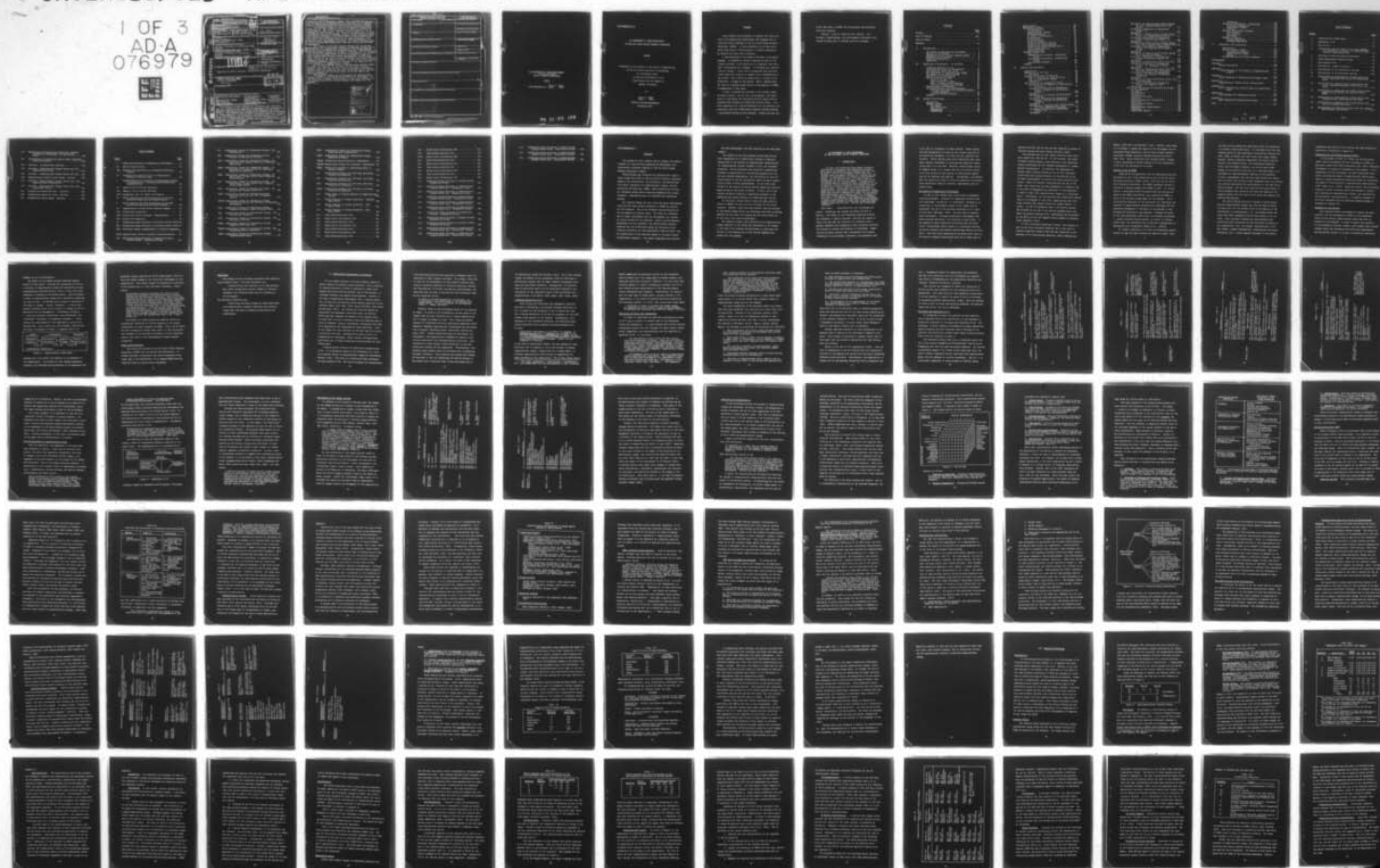
AD-A076 979

AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCH00--ETC F/G 5/1
AN ASSESSMENT OF TEAM DEVELOPMENT AT THE AIR FORCE FLIGHT DYNAM--ETC(U)
SEP 79 R G DEKOK
AFIT/GSM/SM/79-S-3

UNCLASSIFIED

NL

1 OF 3
AD-A
076979



UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS
BEFORE COMPLETING FORM

1. REPORT NUMBER

AFIT/GSM/SM/79-S-3

2. GOVT ACCESSION NO.

3. RECIPIENT'S CATALOG NUMBER

4. TITLE (and Subtitle)

AN ASSESSMENT OF TEAM DEVELOPMENT AT THE
AIR FORCE FLIGHT DYNAMICS LABORATORY

5. TYPE OF REPORT & PERIOD COVERED

M.S. Thesis

6. PERFORMING ORG. REPORT NUMBER

7. AUTHOR(s)

Roger G. DeKok Major, USAF

8. CONTRACT OR GRANT NUMBER(s)

12260

9. PERFORMING ORGANIZATION NAME AND ADDRESS

Air Force Institute of Technology (ATC)
AFIT/EN
Wright-Patterson AFB, Ohio 4543310. PROGRAM ELEMENT, PROJECT, TASK
AREA & WORK UNIT NUMBERS

11. CONTROLLING OFFICE NAME AND ADDRESS

Air Force Institute of Technology
AFIT/EN
Wright-Patterson AFB, Ohio 45433

12. REPORT DATE

September 1979

13. NUMBER OF PAGES

258

14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)

15. SECURITY CLASS. (of this report)

UNCLASSIFIED

15a. DECLASSIFICATION/DOWNGRADING
SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for Public Release; Distribution Unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

JOSEPH P. HIPPS, Major, USAF
Director of Information

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Organization Development

Job Satisfaction

Longitudinal

OD

Job Motivation

Analysis

Organizational Change

Organizational Climate

OD Practitioner

Team Building

Factor Analysis

Change Agent

Team Development

Discriminant Analysis

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The purpose of this research was to evaluate the effectiveness of a team building organization development (OD) intervention currently underway at the Air Force Flight Dynamics Laboratory (AFFDL). Effectiveness was determined by analyzing the longitudinal change from 1978 to 1979 on eleven criterion variables: employee job satisfaction; job motivation; and absenteeism; five factor dimensions of organizational climate; and for Scientists and

DD FORM 1 JAN 73 1473

EDITION OF 1 NOV 65 IS OBSOLETE

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

AD A 076979

DDC FILE COPY

012 225

JOB

UNCLASSIFIED

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

(Block 20, Con't) Engineers (S&Es), three productivity factors. All variables except absenteeism were measured with a questionnaire. Absenteeism data was obtained from laboratory records.

The research design for this study was quasi-experimental using the four main product divisions of AFFDL as subjects for the research. Two of the divisions had participated in the OD program for several years. The other two divisions had no formal involvement with the OD program. Since a pre-OD baseline measurement was not available, the effectiveness research examined both the differences among the divisions for each measurement (1978 and 1979), and the significance of any observed change in criterion scores (longitudinal analysis). 415 usable responses were received in the 1979 measurement; 354 were received in the 1978 measurement.

The results of the data analysis showed that OD had been responsible for a significant increase in employee perceptions of the quality of organizational communication (an organizational climate variable) within the treatment divisions. The OD divisions also exhibited a significant decrease in absenteeism, but attribution of this observed effect to the OD intervention cannot be made unequivocally without further measurements. On the other hand, neither of the control divisions showed significant positive change on any of the eleven criteria. In fact, one of the control divisions suffered a significant decrease on the immediate work group dimension of organizational climate.

On the whole, OD was found to have had some positive effect on AFFDL, but only for two (at most) of the eleven criteria. However, there was some evidence that the process of OD-induced change within the laboratory was still occurring despite the fact that the program was over three years old at the time of the second measurement.

The apparent languid pace associated with organizational change observed in this study was attributed to two causes: 1) the lack of an internal OD facilitator to lend some continuity to the program, and 2) the low-key emphasis and support for the program.

Accession For	
NTIS GRA&I	<input checked="checked" type="checkbox"/>
DDC TAB	<input type="checkbox"/>
Unannounced	<input type="checkbox"/>
Justification	
By _____	
Distribution/ _____	
Availability Codes	
Dist	Avail and/or special
A	

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO.	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle)	5. TYPE OF REPORT & PERIOD COVERED	
7. AUTHOR(s)	6. PERFORMING ORG. REPORT NUMBER	
9. PERFORMING ORGANIZATION NAME AND ADDRESS	8. CONTRACT OR GRANT NUMBER(s)	
11. CONTROLLING OFFICE NAME AND ADDRESS	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS	
14. MONITORING AGENCY NAME & ADDRESS (if different from Controlling Office)	12. REPORT DATE	
	13. NUMBER OF PAGES	
	15. SECURITY CLASS. (of this report)	
	15a. DECLASSIFICATION/DOWNGRADING SCHEDULE	
16. DISTRIBUTION STATEMENT (of this Report)		
17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)		
18. SUPPLEMENTARY NOTES		
19. KEY WORDS (Continue on reverse side if necessary and identify by block number)		
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)		

AN ASSESSMENT OF TEAM DEVELOPMENT
AT THE AIR FORCE
FLIGHT DYNAMICS LABORATORY

THESIS

AFIT/GSM/SM/79S-3 Roger G. DeKok
Major USAF

79 11-05 169

AFIT/GSM/SM/79S-3

AN ASSESSMENT OF TEAM DEVELOPMENT
AT THE AIR FORCE FLIGHT DYNAMICS LABORATORY

THESIS

Presented to the Faculty of the School of Engineering
of the Air Force Institute of Technology

Air University (ATC)

In Partial Fulfillment of the
Requirements for the Degree of
Master of Science

by

Roger G. DeKok
Major USAF

Graduate Systems Management

September 1979

Preface

This research was performed to evaluate the effectiveness of an Organization Development (OD) program that is currently being conducted at the Air Force Flight Dynamics Laboratory (AFFDL). If this evaluation is of some assistance from either a methodological or results standpoint, my efforts will have been worthwhile.

I was attracted to the study of OD early in my degree program. It appeared to offer a solution to many of the "people problems" I had observed as an employee, and those that I anticipated as a manager. In becoming more familiar with OD, though, I found that OD proponents had conducted little empirical research to support their sometimes glowing claims. When offered an opportunity to conduct an OD evaluation, I jumped at the chance. What I learned about OD, both in a general sense and as it was applied to AFFDL, is summarized in this paper.

I wish to express my gratitude to Dr. Michael Stahl, my thesis advisor, for his aid, encouragement, and assistance in unraveling the sometimes puzzling jargon and approaches that pervade the behavioral science field. I am also indebted to Dr. Charles McNichols for his patience and assistance with the interminable computer related problems I encountered during my data analysis. Thanks are also due

to Mr. Max Davis of AFFDL for his guidance and assistance with this research.

Finally, I wish to thank my wife, Carolyn. Her patience, understanding, and encouragement throughout this course of study were a constant source of strength.

Contents

	<u>Page</u>
Preface	ii
List of Figures	viii
List of Tables	x
Abstract	xv
 I. Introduction	 1
The Advent of Organization Development	2
History of OD at AFFDL	4
Background for the Current Research Effort	6
Statement of the Problem	6
Scope and Limitations	8
Hypotheses	9
 II. Organization Development: An Overview	 10
A Working Definition of OD	12
Underlying OD Values and Assumptions	13
The Goals and Objectives of OD	16
Two Approaches to Organizational Change	21
The Phases of the Change Process	24
Overview of OD Interventions	28
The OD Practitioner (ODP)	34
Roles of the ODP	34
Characteristics of ODPs	37
ODPs: Internal versus External	41
ODP Value Dilemmas and Problems	42
Team Building Interventions	44
The Effectiveness of OD Interventions	47
Problems Associated with Current OD Effectiveness Research	48
Selected Research Results	49
Summary	57
 III. Research Methodology	 59
Introduction	59
Research Design	59
The Sample	60
Data Collection	63
Assumptions	64
Limitations	64

Questionnaire	66
Measurement Scales	66
Job Satisfaction	67
Job Motivation	68
Organizational Climate	69
OC Dimensionality	71
OC Factor Interpretation	71
OC Stability	73
Factor Validity	73
OC Factor Summary	74
Productivity Factor Analysis	74
Productivity Dimensionality	76
Productivity Factor Interpretation	76
Item Intercorrelation	77
Absenteeism Data	78
Research Methodology	78
Use of AID	80
Differences by Division: Homogeneous Groups	82
Differences by Division: Hierarchical Groups	82
Discriminant Analysis	83
Summary	84
IV. Results and Discussion	85
Introduction	85
Examination of the Data	85
Discussion	85
Analysis of Division Differences	89
Test of Differences Among Divisions	89
Test of Longitudinal Change	93
Discussion	93
Use of AID to Find Homogeneous Groups	98
AID Splits on the Hoppock Job Satisfaction Criterion	99
Divisional Differences by Homogeneous Groups: Hoppock Job Satisfaction Criterion	102
Discussion	104
AID Splits on the Patchen Job Motivation Criterion	106
Divisional Differences by Homogeneous Groups: Patchen Job Motivation Criterion	108
Discussion	110
AID Splits on Organizational Climate Factor One (F1), Immediate Work Group	110
Divisional Differences by Homogeneous Groups: F1	112
Discussion	112

AID Splits on Organizational Climate Factor Two (F2), Employee/Supervisor Interaction	114
Divisional Differences by Homogeneous Groups: F2	115
Discussion	117
AID Splits on Organizational Climate Factor Three: F3, Organizational Warmth . .	117
Divisional Differences by Homogeneous Groups, Organizational Warmth, F3 . .	119
Discussion	120
AID Splits on Organizational Climate Factor Four (F4), Organizational Communication	122
Divisional Differences by Homogeneous Groups, F4, Organizational Communication	124
Discussion	125
AID Splits on Organizational Climate Factor Five, Supervisory Support	126
Divisional Differences by Homogeneous Groups, Supervisory Support, F5	127
Discussion	129
AID Splits on Productivity Factor One (P1).	130
Divisional Differences by Homogeneous Groups: P1, Management Studies	132
Discussion	133
AID Splits on Productivity Factor Two (P2), External Professional Development . .	133
Divisional Differences by Homogeneous Groups, P2, External Professional Development	135
Discussion	136
AID Splits on Productivity Factor Three (P3), Technical Data	137
Divisional Differences by Homogeneous Groups, P3, Technical Data	138
Discussion	139
Divisional Differences by Hierarchical Groups .	139
Job Satisfaction	140
Discussion	140
Job Motivation	142
Discussion	143
Immediate Work Group	143
Discussion	143
Employee/Supervisor Interaction	145
Discussion	145
Organizational Warmth	145
Discussion	147
Organizational Communication	148
Discussion	149
Supervisory Support	149

Discussion	149
Divisional Differences: Absenteeism	150
Divisional Differences	150
Longitudinal Change	152
Discussion	152
Multiple Discriminant Analysis	154
1978 Analysis	156
1979 Analysis	159
Discussion	161
Summary of Results	163
Primary Hypothesis	163
Secondary Hypothesis	165
 V. Discussion and Conclusions	 167
Introduction	167
The OD Program in AFFDL	168
Intervention Intensity	169
Organizational Change	170
General	172
Recommendations for Further Research	173
 Bibliography	 176
Appendix A	185
Survey Instruments	186
Appendix B	199
A Brief Summary of the Concept of Organizational Climate	200
Appendix C	205
Factor Analysis of Organizational Climate Items	206
Appendix D	209
Organizational Climate Factor Validity Data	210
Appendix E	215
Factor Analysis and Validity Data for Productivity Items	216
Appendix F	217
Data Analysis for Homogeneous Groups	218
Appendix G	233
Data Analysis for Hierarchical Groups	234
Vita	241

List of Figures

<u>Figure</u>		<u>Page</u>
1	Organizational Change Model	7
2	Approaches to OD	22
3	The OD Cube	30
4	Intervention Typology Based on Principal Emphasis of Intervention in Relation to Different Hypo- thesized Change Mechanisms	33
5	Varieties of Team Building Interventions	46
6	Quasi-Experimental Research Design	60
7	Data Analysis Flow	79
8	AID Results: Hoppock Criterion	100
9	Relationship of Job Satisfaction and Age	101
10	Relationship of Job Motivation and Age	108
11	Relationship of Organizational Climate Factor One Scores (Immediate Work Group) and Educational Level	111
12	Relationship of Organizational Climate Factor Two Scores, Employee/Supervisor Interaction, and Grade	115
13	Relationship of Organizational Climate Factor Three, Organizational Warmth, and Position within AFFDL	118
14	Relationship of Organizational Climate Factor Four (Organizational Communication) and Grade	123
15	Relationship of Organizational Climate Factor Five Scores and Educational Level	128
16	Relationship of Productivity Factor One (P1), Manage- ment Studies, and Position	131

17	Relationship of Productivity Factor Two, External Professional Development, and Educational Level	134
18	Relationship of Productivity Factor Three (Technical Data) and Position	138
F-1	AID Tree: Job Motivation (Patchen)	218
F-2	AID Tree: Organizational Climate Factor One (F1), Immediate Work Group	220
F-3	AID Tree: Organizational Climate Factor Two (F2)	222
F-4	Organizational Climate Factor Three: AID Tree	224
F-5	AID Tree: Organizational Climate Factor Four (F4), Organizational Communication	226
F-6	AID Tree: Organizational Climate Factor Five (F5), Supervisory Support	228
F-7	Productivity Factor One (P1): AID Tree	230
F-8	Productivity Factor Two (P2): AID Tree	230
F-9	Productivity Factor Three: AID Tree	231

List of Tables

<u>Table</u>	<u>Page</u>
I Goals and Objectives of Organization Development . .	17
II The OD Change Process	25
III Benefits and Limitations of Information-Gathering Methods	36
IV Characteristics and Abilities of Change Agents Related to Effectiveness	40
V Characteristics of Successful and Unsuccessful Change in Organizations, Including Nondifferentiating Characteristics	50
VI Impact of OD on Outcome Variables	54
VII Impact of OD on Process Variables	55
VIII Demographic Data for AFFDL (1979 Sample)	62
IX Factor Loadings and Intercorrelations of the Four Questions Comprising the Hoppock Measure	68
X Factor Loadings and Intercorrelations of the Four Questions Comprising the Patchen Measure	69
XI Organizational Climate Factor Analysis Summary . . .	72
XII Productivity Categories	75
XIII Productivity Factor Analysis - Combined Data	77
XIV Survey Item Comparison	86
XV Differences Among Divisions on Criterion Scores (1978)	90
XVI Differences Among Divisions on Criterion Scores (1979)	91
XVII Divisional Change (Longitudinal) on Criterion Measures	94
XVIII Combined Year Criterion Variable Intercorrelations .	97
XIX Differences Among Divisions on Hoppock Job Satis- faction Scores: Homogeneous Groups	103

XX	Longitudinal Change for Homogeneous Groups: Job Satisfaction	105
XXI	Longitudinal Change for Homogeneous Groups: Patchen Job Motivation Criterion	109
XXII	Longitudinal Change for Homogeneous Groups: Organizational Climate Factor One (Immediate Work Group)	113
XXIII	Longitudinal Change for Homogeneous Groups: Organizational Climate Factor Two (Employee/Supervisor Interaction)	116
XXIV	Longitudinal Change for Homogeneous Groups: Organizational Climate Factor Three (Organizational Warmth)	120
XXV	Longitudinal Change for Homogeneous Groups: Organizational Climate Factor Four, Organizational Communication	125
XXVI	Longitudinal Change for Homogeneous Groups: Organizational Climate Factor Five	129
XXVII	Longitudinal Change for Homogeneous Groups: Productivity Factor One (P1), Management Studies	132
XXVIII	Longitudinal Change for Homogeneous Groups: Productivity Factor Two (External Professional Development)	136
XXIX	Longitudinal Change for Homogeneous Groups: Productivity Factor Three (Technical Data)	139
XXX	Longitudinal Change for Hierarchical Groups: Job Satisfaction (Hoppock)	141
XXXI	Longitudinal Change for Hierarchical Groups: Job Motivation (Patchen)	142
XXXII	Longitudinal Change for Hierarchical Groups: Immediate Work Group (F1)	144
XXXIII	Longitudinal Change for Hierarchical Groups: Employee/Supervisor Interaction	146
XXXIV	Longitudinal Change for Hierarchical Groups: Organizational Warmth	147

XXXV	Longitudinal Change for Hierarchical Groups: Organizational Communication	148
XXXVI	Longitudinal Change for Hierarchical Groups: Supervisory Support	150
XXXVII	Differences Among Divisions on Absenteeism . .	151
XXXVIII	Longitudinal Change for Divisions: Absenteeism	151
XXXIX	Sensitivity Analysis of Absenteeism Rates to Chronic Illness	153
XL	Discriminant Analysis for 1978 Data (Excluding Productivity Measures)	157
XLI	Discriminant Analysis for 1978 Data (Including Productivity Measures)	159
XLII	Discriminant Analysis for 1979 Data (Excluding Productivity Variables)	160
XLIII	Discriminant Analysis for 1979 Data (Including Productivity Measures)	162
B-1	Factor Names of Various Measures of Organizational Climate	202
C-1	Factor Analysis of Climate Questions - Combined Data (N=719)	206
C-2	Factor Analysis of Climate Questions - 1978 Data (N=322)	207
C-3	Factor Analysis of Climate Questions - 1979 Data (N=387)	208
D-1	Item Intercorrelations (F1)	210
D-2	Factor Score Correlations (F1)	210
D-3	Item Intercorrelations (F2)	211
D-4	Factor Score Correlations (F2)	211
D-5	Item Intercorrelations (F3)	212
D-6	Factor Score Correlations (F3)	212
D-7	Item Intercorrelations (F4)	213

D-8	Factor Score Correlations (F4)	213
D-9	Item Intercorrelations (F5)	214
D-10	Factor Score Correlations (F5)	214
E-1	Item Intercorrelations (P1)	216
E-2	Factor Score Correlations (P1)	216
E-3	Item Intercorrelations (P2)	216
E-4	Factor Score Correlations (P2)	216
E-5	Item Intercorrelations (P3)	216
E-6	Factor Score Correlations (P3)	216
F-1	Differences Among Divisions on Patchen Scores: Homogeneous Groups	219
F-2	Differences Among Divisions on Organizational Climate Factor One: Homogeneous Groups . .	221
F-3	Differences Among Divisions on Organizational Climate Factor Two: Homogeneous Groups . .	223
F-4	Differences Among Divisions on Organizational Climate Factor Three: Homogeneous Groups .	225
F-5	Differences Among Divisions on Organizational Climate Factor Four: Homogeneous Groups . .	227
F-6	Differences Among Divisions on Organizational Climate Factor Five: Homogeneous Groups . .	229
F-7	Differences Among Divisions on Productivity Factors: Homogeneous Groups	232
G-1	Differences Among Divisions on Hoppock Scores: Hierarchical Groups	234
G-2	Differences Among Divisions on Patchen Scores: Hierarchical Groups	235
G-3	Differences Among Divisions on Organizational Climate Factor One: Hierarchical Groups . .	236
G-4	Differences Among Divisions on Organizational Climate Factor Two: Hierarchical Groups . .	237

G-5	Differences Among Divisions on Organizational Climate Factor Three: Hierarchical Groups .	238
G-6	Differences Among Divisions on Organizational Climate Factor Four: Hierarchical Groups . .	239
G-7	Differences Among Divisions on Organizational Climate Factor Five: Hierarchical Groups . .	240

Abstract

The purpose of this research was to evaluate the effectiveness of a team building Organization Development (OD) intervention currently underway at the Air Force Flight Dynamics Laboratory (AFFDL).

Effectiveness was determined by analyzing the longitudinal change from 1978 to 1979 on eleven criterion variables: employee job satisfaction, job motivation, and absenteeism; five factor dimensions of organizational climate; and for Scientists and Engineers (S&Es), three productivity factors. All variables except absenteeism were measured with a questionnaire. Absenteeism data was obtained from laboratory records.

The research design for this study was quasi-experimental using the four main product divisions of AFFDL as subjects for the research. Two of the divisions had participated in the OD program for several years. The other two divisions had no formal involvement with the OD program; they served as control groups for the analysis. Since a pre-OD baseline measurement was not available, the effectiveness research examined both the differences among the divisions on the criterion variables for each measurement (1978 and 1979), and the significance of any observed change in criterion scores (longitudinal analysis). 415 usable responses were received

in the 1979 measurement, 354 were received in the 1978 measurement.

The results of the data analysis showed that OD had been responsible for a significant increase in employee perceptions of the quality of organizational communication (an organizational climate variable) within the treatment divisions. The OD divisions also exhibited a significant decrease in absenteeism for the periods analyzed over the one year between measurements, but attribution of this observed effect to the OD intervention cannot be made unequivocally without further measurements. On the other hand, neither of the control divisions showed significant positive gains on any of the eleven criteria. In fact, one of the control divisions suffered a significant decrease on the immediate work group dimension of organizational climate.

On the whole, OD was found to have had some positive effect on AFFDL, but only for two (at most) of the eleven criteria. However, there was some evidence that the process of OD-induced change within the laboratory was still occurring despite the fact that the program was over three years old at the time of the second measurement.

The apparent languid pace associated with organizational change observed in this study was attributed to two causes: 1) the lack of an internal OD facilitator to lend some continuity to the program; and, 2) the low-key emphasis and support for the program.

AN ASSESSMENT OF TEAM DEVELOPMENT
AT THE AIR FORCE FLIGHT DYNAMICS LABORATORY

I Introduction

In 1973, the Conference Board asked 13 eminent authorities to speculate what significant management issues and problems would develop over the next 20 years. One of the strongest themes that runs through their subsequent reports is a concern for the ability of organizations to respond to environmental change. As one person wrote: "It follows that an acceleration in the rate of change will result in an increasing need for reorganization. Reorganization is usually feared, because it means disturbance of the status quo, a threat to people with vested interests in their jobs, and an upset to established ways of doing things." Subsequent events have confirmed the importance of this concern about organizational change. Today more and more managers must deal with new government regulations, new products, growth, increased competition, technological development, and a changing work force. In response, most companies or divisions of major corporations find they must undertake moderate organizational changes at least once a year and major changes every four or five. [Kotter and Schlesinger, 1979:106].

This theme is encountered with ever increasing frequency. Technology has changed the nature of work in America. The number of jobs employing unskilled workers has undergone a dramatic decrease, and with the demise of these jobs has come the creation of a workforce with a greatly expanded lower managerial class, specially educated and trained to oversee the products of technology. Organizations quickly realized that concomitant with capital investment in new processes, materials, and equipment came

a new type of investment--in human capital. Human capital required expenditures as large as the outlays required for new plants and equipment, but there was one important distinction. Unlike capital goods which depreciate when used, human capital (investment in training and education) depreciates when it is not used. Moreover, human capital cannot be legally owned, i.e., bought and sold in the marketplace. It is only rented for that period of time mutually agreed upon by the employee and employer. Increasingly, top management was faced with unrest in this new workforce--a situation which manifested itself in turnover, absenteeism, and low productivity.

The Advent of Organization Development

It was in this context that a new field of management consulting emerged. Although not completely divorced from the traditional "scientific" or "structural" orientation of consulting, it was primarily aimed at the "human side of enterprise" (as one of the pioneers described it in a book by that name) [McGregor, 1960]. The new field is organization development. Although organization development (OD) defies precise definition, its evolution is well known. It was spawned by early behavioral scientists from two major roots: interpersonal skills taught in a laboratory setting, and survey research and feedback methodology [French and Bell, 1973]. From that early beginning OD has grown until many of the nation's largest corporations have had at least some ex-

perience with OD, and its use has been exported to scores of countries around the world [French and Bell, 1978].

The military has not been immune from the forces that have created the need for OD. On the contrary, the nature of modern warfare places a high premium on ever advancing weapons technology and the attendant phenomenon of "technological obsolescence." In addition, the Department of Defense (DOD) recently entered an era of "all volunteer" forces which has focused attention on the ability of the military establishment to attract and retain qualified personnel. These two thrusts, technology and the end of the draft, have forced top military management to recognize that a new style of management was desirable (if not mandatory) in order to deal with organizational change on a continuing basis. Accordingly, all the services have established various types of OD programs to help their organizations deal with human concerns that always attend such change [Umstot, in press]. In 1977 an estimated total of 53 million dollars was invested by the DOD in the various programs which fall under the general heading of OD, establishing the OD program of the DOD as by far the largest single program in existence today [Langford, 1978].

Is this investment producing a return? The evidence to date is far from conclusive primarily due to the lack of rigorous empirical research that has been conducted on the efficacy of OD interventions [Morrison, 1978; Cummings and

Malloy, 1977; White and Mitchell, 1976]. However, this study is an attempt to assess the impact of one OD program that is currently being conducted at the Air Force Flight Dynamics Laboratory (AFFDL) located at Wright-Patterson Air Force Base, Ohio. Before describing the analysis effort, though, a short chronology of events leading up to the introduction of OD into the laboratory is in order.

History of OD at AFFDL

Inspired by the popularity that OD interventions had experienced at other local laboratories such as the Air Force Materials Laboratory (AFML) [Trask, 1973] and the Air Force Aero Propulsion Laboratory, the AFFDL leadership decided to introduce a similar program into AFFDL in 1976. Dr. George Lehner, a nationally known OD practitioner who had participated in the AFML intervention, was contacted by AFFDL to serve as an external change agent for the program. After surveying the personnel of the laboratory for individual perceptions of organizational problems and conferring with the laboratory management on the goals of the program, a team building OD intervention was selected. Although the goals of the team development effort were not formally documented, "...goals of people working harder, or better, or feeling better about the laboratory were verbalized" subsequently in discussions with researchers [Stahl et al., 1978:2].

Dr. Lehner's practice is to visit the laboratory approximately 16 days per year (usually two days at a time), meet-

ing with various groups and committees within the laboratory on a rather unstructured basis. In accordance with the wide ranging nature of team development interventions [French and Bell, 1973], he meets with some intact work teams (family groups), various laboratory committees (the Branch Chief's Council, the Corporate Board, the Professional Advisory Group, and the Woman's Seminar), as well as less formal groups at the division level--all on a voluntary basis, i.e., attendance at team development sessions is not mandatory. In fact, considerable care has been taken within the laboratory to ensure that division level management does not perceive any coercion associated with participation in the team development program. The fact that some divisions participate in the OD program while others do not forms the basis for the research design that was used in this study (see Chapter III, Research Methodology).

The exact methods used by Dr. Lehner in facilitating desired organizational change vary with the type of group he works with, but the primary focus of all aspects of the intervention is interpersonal, i.e., how people within the group feel about themselves and how they relate to one another. Such "process" programs are distinguished from activities which concentrate on the structural variables of the organization, e.g., job design, organizational "size" and "shape," reward contingencies, formalization and standardization, etc. A more complete treatment of the values,

assumptions and goals of OD in general and team building in particular is provided in Chapter II.

Background for the Current Research Effort

In the summer of 1977, Dr. Lehner and the laboratory staff officer responsible for the OD program at AFFDL, Mr. Max Davis, asked three AFIT researchers (Drs. Stahl, McNichols, and Manley) to conduct an assessment of the program. After discussion with the principals, the AFIT researchers formulated a multivariate model of organizational effectiveness based on a model proposed by Kilman and Herden for evaluating the impact of interventions on organizational effectiveness [1976; Stahl et al., 1978]. Using this model, the researchers prepared a survey instrument which was designed to measure such variables as organizational climate, job satisfaction, job motivation, and productivity. A complete treatment of both this instrument and the resulting research design is presented in Chapter III.

Statement of the Problem

This research effort was designed to answer one basic question: has the OD program at AFFDL had any measurable effect on the various organizational goals that were expressed for the program? In order to answer this question it was necessary to survey, analyze, and document goal-related changes within the laboratory with sufficient experimental and statistical control to be able to relate any discovered

changes to the OD intervention.

The effect of one change variable deserves special mention at this point. Although the importance of time as a variable in organizational change was identified by early organizational theorists [Likert, 1967], it has often been neglected in analyses of OD effectiveness. Likert proposed a model of organizational change which explicitly recognizes the role of time. He defined three classes of variables in his model of change: "causal" variables, "...those independent variables which can be altered or changed by the organization and its management"; "intervening" variables "...such as attitudes, motivations, and perceptions;" and "end-result" variables, the dependent variables "...which reflect the achievements of the organization, such as its productivity, costs, scrap loss, and earnings" [1967:26-29]. His model, as adapted in Figure 1, suggests that an OD

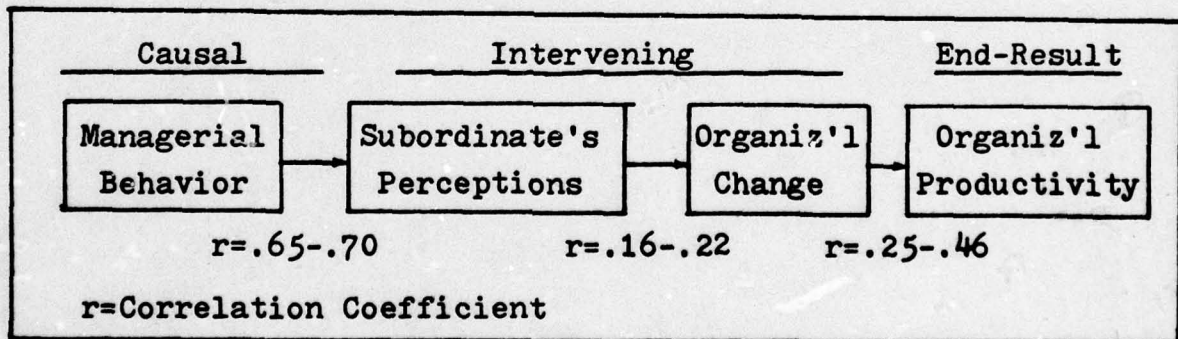


Figure 1. Organizational Change Model

program will first affect the behavior of the managers of the organization. As a result of this changed managerial behavior, the attitudes and perceptions of the employees will

gradually change (assisted by the OD change agent), which in turn will effect change in the collective development of the organization. This latter change will gradually be reflected in the productivity or other end-result variables. Likert states:

The available evidence indicates that there are consistent and dependent relationships among the causal, intervening, and end-result variables. When all of the relevant factors are taken into consideration, especially time, and the proper analyses made, consistent, positive relationships can be expected among the causal, intervening, and end-result variables in every organization. ...the closer two variables are in the causal-intervening-end result sequence ... the more marked the observed relationships tend to be. The farther apart the variables are in the sequence and the greater the probable time interval between changes in one and changes in the other, the lower the correlations tend to be. [1967: 98-99, 81].

This model was tested during the research effort by a longitudinal comparison of various measures in the causal-intervening-end result sequence at AFFDL. Since the OD effort had been on-going for almost three years, it was anticipated that changes in the end-result variables would be relatively greater than those in the intervening or causal variable categories.

Scope and Limitations

This study was confined to the Air Force Flight Dynamics Laboratory (AFFDL) and its specific OD intervention. No attempt was made to generalize the results obtained to any other type of OD intervention, or to compare AFFDL with any other Air Force or non-Air Force laboratory.

Hypotheses

One primary and one secondary hypothesis were tested in this research effort. The main hypothesis was:

Divisions which are involved in the team development effort showed more positive change on criterion variables than divisions which are not involved in the OD program.

The secondary hypothesis was:

Intervening variables (primarily those associated with organizational climate) exhibited less positive change than end-result variables (productivity and absenteeism).

II Organization Development: An Overview

It is a common practice in writing research papers to define clearly the subject being researched. Such a practice is clearly warranted in order to establish a common bond between the writer and his audience, and in the process, to eliminate confusion and expose misconceptions. However in the case of organization development (OD), a precise definition to which all OD theorists would readily subscribe is non-existent [Hand, 1975; Kahn, 1974; Porras and Berg, 1978; White and Mitchell, 1976]. The reasons for this are debated by researchers and management theorists alike, but Patrick Connor may have captured the essence of the argument when he noted that "one has a difficult time even deciding what to call OD--movement, process, philosophy, and approach all seem to be appropriate and inappropriate terms [1977:635]. Part of the reason for this confusion is the fact that OD is still a relatively new term. Although OD is used to refer to a conglomerate of techniques, terms, styles, and approaches, practically all of these things have evolved within the last twenty years.

A second reason concerns the theoretical underpinnings of OD. It is generally agreed in the literature that there is no general theory of organizational change and development [Bowers, 1975]. This lack of a theoretical base epitomizes the rapid growth of OD. The first successful OD interventions

were well-publicized and well-received by managers eager for solutions to their "people" problems. As a result, there was no time for the development of well-reasoned theories that could be carefully subjected to extensive empirical testing. The "discoverers" of OD were its earliest practitioners, and they were soon too busy to develop the usual scientific base. As one researcher notes:

It [OD] is too autobiographical a literature, too concentrated on the experiences of the trainees and change agents. It is a literature of training episodes.... [Kahn, 1974:493].

Finally, there is the dichotomous nature of the opposing OD camps. As noted in the introduction, OD was based on the premise that the most effective way to change organizations was to change the people in them. This "human processual" approach is contrasted with more traditional approaches which emphasize changing organizational technologies and structures (the so-called "technostructural" activities) [Porras and Berg, 1978]. Change methods involving job enrichment, job enlargement, and organizational redesign are typical interventions associated with technostructural activities. This difference in focus--people versus structure--is the main distinction between the two approaches. Unfortunately, both opposing camps operate under the OD banner with considerable attendant confusion. This situation has caused some leading OD theorists to call for abandoning the term OD because it has become such a catch-all that it has lost almost all of

its specificity [Jones and Pfeiffer, 1977]. As of this writing, though, OD remains as the predominant term for effecting organizational change, and its usage normally encompasses both human and structural variables. Consequently, the specific type of activities used by an OD consultant* depends on the orientation of the consultant based on his own private conceptualization of OD [White, 1976; Stein, 1977; Tichy, 1976].

A Working Definition of OD

After noting the difficulty that management theorists have had in developing a universally accepted definition of OD, it borders on the foolhardy to try to define the term; yet a working definition of OD will be necessary for the very reasons noted earlier in the chapter. Consequently, with apologies to the technostructuralists, the following often-quoted definition first proposed by Richard Beckhard will be used:

Organization development is an effort (1) planned, (2) organization-wide and (3) managed from the top, to (4) increase organizational effectiveness and health through (5) planned interventions in the organization's "processes" using behavioral science knowledge. [1969, Ch 2:9]
[emphasis in original]

At the risk of losing some "depth," the key elements of this definition can be reduced to: OD is the process of planned organizational change, brought about by a change agent, to increase organizational effectiveness by emphasizing the human variables of the organization. Who is this change agent?

* The terms "consultant," "practitioner," "interventionist," and change agent are used synonymously in the literature.

Bennis summarizes the prevalent opinion in the literature when he stated that "the change agent is almost always a professional behavioral scientist" [1969:11]. At face value this attitude appears to reflect professional snobbery, but it is more likely another manifestation of the human-processual versus technostuctural argument. Nevertheless, the requirement for some type of change agent, usually external to the organization, is an almost universally mentioned requirement. The preceding implies, of course, that unless some change agent ...initiates or helps to initiate the needed change, an organization is not likely to move in the direction of becoming self-renewing, and effective [Bowen, 1977:551].

Underlying OD Values and Assumptions

In order to understand the sometimes contradictory nature of OD it may be helpful to examine some of its underlying values and assumptions. In a particularly well written article, Friedlander asserts that the interplay of three values--rationalism, pragmatism, and existentialism--are the essential ingredients of OD. In his words:

The rationalistic force within OD stems largely from its disciplinary forebears. These are principally psychology (personality and social psychology), sociology (organizational and systems), and anthropology (cultural and social). Within these disciplines, theories of small groups, organization, and systems have stretched toward ...personal growth, group dynamics, organizational change, and systems development.

The pragmatic force in OD is clearly in applications toward organizational improvement. The pragmatist draws upon his practical knowledge of the organization rather than upon disciplinary knowledge. The emphasis is upon "know-how" rather than "know-about." The pragmatist

will...tend to replace the rationalists conceptual model with first-hand action research.

The existential force within OD focuses primarily upon the experience of the individual, his personal choices and commitments within the organizational field. The existentialist is less concerned in diagnosis than in understanding the experimental flow of the individual,...less interested in changing the individual than in accepting him; and less interested in change than the individual's commitment to his own choices. [1976:18-19].

Given the widely diverging perspectives of these three underlying values, it is little wonder that a general theory of organizational change has not yet emerged.

The basic assumptions of OD obviously reflect the values that have been presented, but they do so at a much lower level of abstraction. Reviews of the literature [Connor, 1977] usually result in a list of assumptions similar to that compiled by French and Bell, and they, in turn, acknowledge the theories of McGregor, Likert, Argyris, Bennis, Schein, Maslow, and Herzberg in presenting the following list [1973:65]:

1. Most individuals have drives toward personal growth and development if provided an environment that is both supportive and challenging.
2. Most people desire to make, and are capable of making, a higher level of contribution to the attainment of organizational goals than most organizational environments will permit.
3. For a group to optimize its effectiveness...group members must assist each other with effective leadership and member behavior.
4. Suppressed feelings adversely affect problem solving, personal growth, and job satisfaction.
5. The level of organizational trust, support, and co-operation is much lower in most groups and organizations

than is either necessary or desirable.

6. The solutions to most attitudinal and motivational problems in organizations are transactional.

7. The interrelated dynamics of [overlapping] work teams and the manager's behavior in both [these] work teams are highly significant factors in organizational life.

8. Policies and practices of the broader organization affect the small work group and vice versa.

9. "Win-lose" conflict strategies between people and groups..are not optimal in the long run to the solution of most organizational problems.

10. OD strategies will be unsuccessful to the degree that system members place value in anarchy, hate, violence, or destruction.

From this list it is relatively easy to identify assumptions which are derived from each of the three values underlying OD. However, and perhaps more important, should be the recognition of the inherent "humanism" of OD. If OD can be said to have a management philosophy, it surely tends toward McGregor's Theory Y and Likert's System Four orientations.

Another important dimension of these assumptions is the emphasis that is placed on the individual's immediate work group. This concept is developed in greater detail later in this paper when the specifics associated with team development are reviewed.

Lastly is the view of the organization itself. From the list of assumptions it can be inferred that the organization consists of overlapping work groups with each group possessing different needs and goals. Additionally, the organization is viewed with an open-systems perspective which recognizes that

the "...boundaries around the organization are permeable; and that its interaction with its environment is a significant force in determining how the organization functions and develops" [Beckhard and Harris, 1977:59].

This section has attempted to define the dimensions of OD and provide some insights into its underlying values and assumptions. With that difficult task hopefully accomplished, it is now possible to examine the goals of OD in its attempt to accomplish planned organizational change. With the question of "what is OD?" at least superficially answered, the question "what does OD do?" can now be addressed.

The Goals and Objectives of OD

In attempting to answer the question of what benefits can be expected from an OD intervention, it was necessary to survey the literature on the goals and objectives of OD. Surprisingly, a rather extensive (although by no means exhaustive) search revealed only five different sets of OD goals or objectives (the distinction between these terms is quite blurred). These sets are contained in Table I.

The consistency among these sets is remarkable given that two of the authors (Beckhard and Burke/Schmidt) view OD as encompassing more than the human processual approach. Two factors in particular appear to be common across these goal sets: the need to obtain congruency between individual and organizational goals, and the emphasis on conflict resolution. The desire to obtain goal congruency is understandable if efforts toward

Table I
Goals and Objectives of Organization Development

<u>Authors</u>	<u>Goals/Objectives</u>	<u>Comments</u>
Beckhard (1969)	<p>(1) To develop a self-renewing, viable system that can organize in a variety of ways depending on tasks.</p> <p>(2) To optimize the effectiveness of both the stable...and the temporary systems...by built-in continuous improvement mechanisms.</p> <p>(3) To move toward high collaboration and low competition between inter-dependent units.</p> <p>(4) To create conditions where conflict is brought out and managed.</p> <p>(5) To reach the point where decisions are made on the basis of information source rather than organization role.</p>	<p>a. Note correspondence with Beckhard's definition of OD.</p> <p>b. Emphasis on inter-group cooperation.</p>
Bennis (1969)	<p>(1) Improvement in interpersonal competence.</p> <p>(2) A shift in value so that human facets and feelings come to be considered legitimate.</p> <p>(3) Development of increased understanding between and within groups.</p> <p>(4) Development of more effective team management.</p>	

Table I (Con't)

Authors	Goals/Objectives	Comments
Burke and Schmidt (1971)	(5) Development of better methods of conflict resolution.	a. Note similarity with Beckhard's goal
	(6) Development of organic rather than mechanical systems.	b. The mechanistic-organic construct is analogous to Likert's System Four focus
	(1) Facilitate problem solving on the job.	
	(2) Plan and implement changes more systematically.	
	(3) Increase sense of "ownership" of organizational objectives throughout the work force	a. OD efforts must be congruent with whatever the organization is trying to accomplish
Friedlander and Brown (1974)	(4) Create conditions so that decisions are made on the basis of competence rather than organizational role.	b. Emphasis on conflict resolution again
	(5) Create conditions where conflict is managed creatively rather than avoided.	
	(1) Creating an open problem-solving climate.	
	(2) Supplementing the authority of role and status with the authority of knowledge and competence.	a. Similar to previous goals relating to decision making
	(3) Locating decision making and problem	

Table I (Con't)

Authors	Goals/Objectives	Comments
	<p>solving as close to information sources as possible.</p> <p>(4) Building trust and collaboration.</p> <p>(5) Developing a reward system which recognizes the organizational mission and the growth of people.</p> <p>(6) Helping managers to manage according to relevant objectives rather than past practices.</p> <p>(7) Increasing self-control and self-direction for the people within the organization.</p>	
French (1969)	<p>SELF OBJECTIVES</p> <p>(1) Increased awareness of feelings and reactions of others and their impact on self.</p> <p>(2) Increased awareness of own feelings and reactions, and impact on others.</p> <p>(3) Increased awareness of dynamics of group action.</p> <p>(4) Changed attitudes toward self, others, and groups.</p> <p>(5) Increased interpersonal competence...</p> <p>ROLE OBJECTIVES</p> <p>(1) Increased awareness of own organizational role, organization dynamics, dynamics of larger social systems, and dynamics of the change process.</p>	<p>a. Laboratory training emphasis on personal and interpersonal objectives</p>

Table X (Con't)

Authors	Goals/Objectives	Comments
	<p>(2) Changed attitudes toward own role, role of others, and organizational relationships.</p> <p>(3) Increased interpersonal competence in handling organizational role relationships with supervisors, peers, and subordinates.</p> <p>ORGANIZATIONAL OBJECTIVES</p> <p>(1) Organizational improvement through the training of the relationships of groups rather than isolated individuals.</p> <p>(2) Increased awareness of and changed attitudes toward specific organizational problems.</p>	
Porter, Lawler and Hackman (1975)	<p>(1) Development of a high level of trust throughout the organization.</p> <p>(2) Open communication.</p> <p>(3) Confrontation of conflict.</p> <p>(4) Maximization of collaboration and teamwork.</p> <p>(5) Capacity for organizational revitalization.</p>	<p>a. Each goal has a logical relationship to each other, i.e., each successful goal becomes a means for attaining the next goal</p>

change are to be effective. However, the idea of encouraging conflict to surface so it can be managed is a unique OD objective that apparently reflects the interpersonal, group (or team) building orientation of much of the OD movement.

As a final comment, it is important to note that the "imprecise" nature of OD goals is readily apparent. Researchers have found to their chagrin that such goals create "soft" criteria and introduce complex measurement problems in the assessment of OD effectiveness [Lindell and Drexler, 1979; Cahn, 1977; White and Mitchell, 1976; Armenakis et al., 1976]. Further development of this topic is presented later in the paper when OD effectiveness is reviewed.

Two OD Approaches to Organizational Change

Like its definition, the approaches to OD enjoy less than unanimity of opinion. There are two distinct viewpoints. As befits its humanistic orientation, one focus of change in OD is the individual--either singly, or as suggested in the last chapter--in the context of the immediate work group. This is the human processual approach. It concentrates on the "people" factor in organization processes (e.g., communication, problem solving, and decision making).

As Friedlander and Brown report:

This orientation to OD is rooted in the academic fields of psychology, social psychology, and anthropology, and in the applied disciplines of group dynamics and the human relations movement. Human process-oriented change agents tend to value human fulfillment highly and to expect improved organiza-

tional performance to follow on improved human functioning and processes. [1974:326-327].

On the other hand, the technostructuralists claim that the relationship between improved organizational performance and improved human processes is not strong [Quinn, 1978]. In contrast to the "human" focus of the processual approach, the structuralists concentrate on task methods and the relationships and roles within an organization. Friedlander and Brown characterize it as:

Technostructural approaches are rooted in the fields of engineering, sociology, psychology, economics, and open systems theory. Change interventions are intended to affect the work content and method, and to affect the sets of relationships among workers. [1974:320].

As different as these two approaches appear on the surface, there is considerable overlap as depicted in the figure below. The organization can be conceptualized to

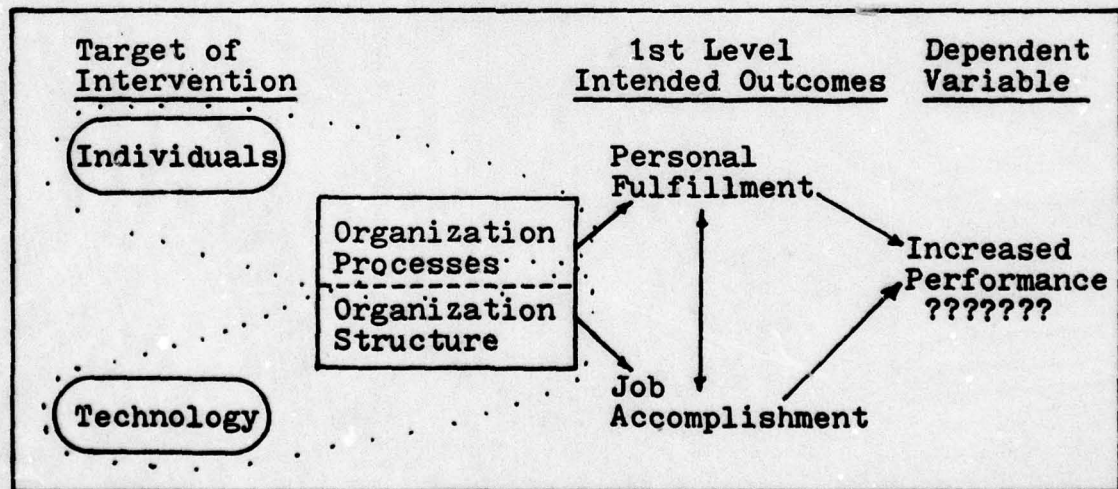


Figure 2. Approaches to OD

include a number of components such as people, technology,

and a process/structural component that some refer to as organizational climate. The environment, in turn, interacts with all these components in terms of the input-output process.

Although the human-processual and technostuctural schools have different approaches for initiating organizational change, they converge and overlap in the climate dimension because of the interactive effects of individuals on structure and vice versa. In like manner, the first-level intended outcomes of each approach are also not free of their own interactive effects. The question marks depict the influence of other intervening variables that exist between the intended outcomes and the criterion of increased organizational effectiveness. While this model undoubtedly simplifies all the various interactions that exist, it does help to illustrate that neither a pure "human" or "technological" approach is possible in practice. In fact, there is considerable evidence to suggest that interventions aimed at one element, to the exclusion of the other, produce particularly disappointing results [Quinn, 1978; Friedlander and Brown, 1974; Porras and Berg, 1978; Cahn, 1978]. For this reason:

...effective programs of organizational change usually involve the simultaneous use of more than one type of approach, and a variety of intervention techniques. Unfortunately, when multiple approaches are used, it usually is quite difficult to be sure exactly which interventions were crucial in causing observed changes and which had negligible (or even negative) effects. [Porter, Lawler, and Hackman, 1975:439].

The Phases of the Change Process

In contrast to the paucity of OD goal sets, the stages of the change process are included in most discussions of OD theory. A representative sample, chosen from the literature to avoid literal duplication, is provided in Table II. It is generally recognized that most theories of change are patterned after the paradigm of "unfreeze-change-refreeze" first suggested by Kurt Lewin [Bowen, 1978:81; Kahn, 1974:487; Leach, 1978:35-36]. In Lewin's words:

A change toward a higher level of group performance is frequently short-lived; after a "shot in the arm," group life returns to the previous level. This indicates that it does not suffice to define the objectives of planned change in a group's performance as the reaching of a different level. Permanency of the new level, or permanency for a desired period, should be included in the objective. A successful change includes, therefore, three aspects: unfreezing (if necessary) the present level, moving to the new level, and the freezing of group life to the new level [French, Bell, and Zawacki, 1978:70].

All the definitions of the change process listed in Table II are based to some extent on the Lewinian process. Especially noticeable is the requirement for some sort of continuous "process maintenance," which corresponds to the "refreezing" stage in Lewin's model. This unanimity of opinion by OD theorists is refreshing. The major difference among the various change processes listed is the number of steps included. Before the "unfreezing" stage occurs it is necessary for someone to determine that an organization needs to change (usually the management of the organization).

Table II. The OD Change Process

Authors	Change Process	Comments
French and Bell (1978)	(1) Diagnosis	a. Identifies strengths and weaknesses
	(2) Action	b. Action plans are developed to correct problem areas
	(3) Process-Maintenance	c. Concerned with feedback-control
Lippitt, Watson & Westley (1958)	(1) Development of a need for change	Based on the Lewinian process
	(2) Establishment of a change relationship	
	(3) Diagnosis of client's problem	
	(4) Establishing goals and intentions of action	
	(5) Transformation of intentions into actual change efforts	
	(6) Generalization and stabilization of change	
	(7) Achieving a terminal relationship	
McGill (1977)	(1) Convergence of interest	a. Phases 1-3 set the "context"
	(2) Establishing the charter	b. Phases 4-8 comprise the "action step cycle"
	(3) Legitimization and sponsorship	
	(4) Problem identification	
	(5) The general plan	
	(6) Action hypothesis	c. Phase 9 reinitiates the cycle
	(7) Action step	
	(8) Formative evaluation	
	(9) Problem reidentification	

Table II (Con't)

Authors	Change Process	Comments
Miles and Schmuck (1976)	(1) Initial interest (2) Management initiation (3) Establishing client-practitioner relationship and setting goals (4) Data collection (5) Joint diagnosis (6) Intervention (7) Data collection (8) Process maintenance (9) Institutionalization of OD	a. Entire process takes 2-3 years before phase 9 b. Steps 1-8 change the "culture" of the organization
Nadler (1977)	(1) Scouting (2) Entry (3) Diagnosis (4) Planning (5) Action (6) Evaluation (7) Termination	a. Lewinian orientation b. Frequently encountered paradigm
Warrick (1976)	(1) Needs assessment (2) Program negotiation (3) Diagnosis (4) Intervention and change (5) Stabilization (6) Program evaluation (7) Program follow-up	a. Focus is on public organization where some peculiar "roadblocks" to change occur

Once this is done and outside assistance is requested, an OD practitioner will attempt to diagnose the problem and develop a specific treatment or treatments. This phase of the change process is the key to OD and as such it warrants a much closer examination. The role of the change agent in this phase and the various types of intervention techniques at his disposal is the topic of the next section.

Finally, the time period required to effect necessary changes should be mentioned. The reader will recall that in the introduction it was noted that Likert was one of the first management theorists to recognize the importance of time as a variable in the change process. Likert mentions that failure to obtain expected results in a research project is often the result of neglecting the effect of time [1967]. Empirical evidence supporting this view is provided by Porras and Berg. In two recent reviews of the impact of OD activities on organizational change, they reported that many OD studies (82 per cent) were conducted for less than two years, a fact they state may impact on the measurement of OD efficacy [1978]. In another article they report that changes in outcome variables (satisfaction, performance, absenteeism, and turnover) in particular, are positively related to the length of the OD intervention. From their work it appears that OD exposure periods of greater than 25 months yield the greatest outcome variable change [1978].

Overview of OD Interventions

In the preceding sections the process of organizational change was introduced; the goals, values, and assumptions of OD were reviewed; and the two basic approaches of OD were described in rather general terms. With this as background, the core areas of OD are examined in the following order: a brief overview of the various types of OD interventions (to put team development in its proper perspective); the role of the change agent; the basic characteristics of each of the "process" techniques; and a survey of research on the efficacy of OD in effecting organizational change.

Argyris provides an insight into the term "intervention" with this definition:

To intervene is to enter into an ongoing system of relationships, to come between or among persons, groups or objects for the purpose of helping them [1970:15].

More specifically related to OD:

The term OD interventions refers to the range of planned programmatic activities clients and consultants participate in during the course of an organization development program. These activities are designed to improve the organization's functioning...OD interventions constitute the continually evolving technology--the methods and techniques--of the practice of organization development. [French and Bell, 1973:97].

In short, OD interventions are the means for achieving the changes in organizational characteristics that were discussed in the previous section. OD terminology for the person who implements the technique(s) is varied: change agent, interventionist, practitioner, and consultant are all used by

various authors. The term OD practitioner (ODP) is used primarily in this paper. His basic tasks are diagnosis of the problems, selection of the appropriate intervention, and implementation of the selected intervention within the organization. To accomplish these tasks the ODP brings certain training, experience, values, and tools to the organizational setting. His role, particularly in diagnosis, is so important that a separate subsection of this chapter is devoted to this topic. Before beginning that topic, however, it may be helpful to overview the various types of OD interventions that are at his disposal.

The literature is replete with various ways of classifying OD interventions. Some authors prefer to view interventions as a four dimensional construct with separate axes for individual, group, task, and process orientations [French and Bell, 1973:105]. This scheme suffers from the fact that many intervention techniques overlap quadrants, and worse yet, a single intervention technique may shift emphasis from use to use depending on particular organizational circumstances. Interventions simply are not mutually exclusive. While such a scheme may assist in differentiating human-processual interventions from technostructural ones, it does little to distinguish the multiplicity of techniques within either approach from one another.

Two solutions to the above problem are offered. One is to conceptualize interventions by the problems diagnosed, the

focus of attention of the particular intervention, and the specific intervention technique. This classification method, which results in an "OD Cube," was first proposed by Miles and Schmuck [1976]. A diagram of this scheme is shown in Figure 3. The authors define the various modes of inter-

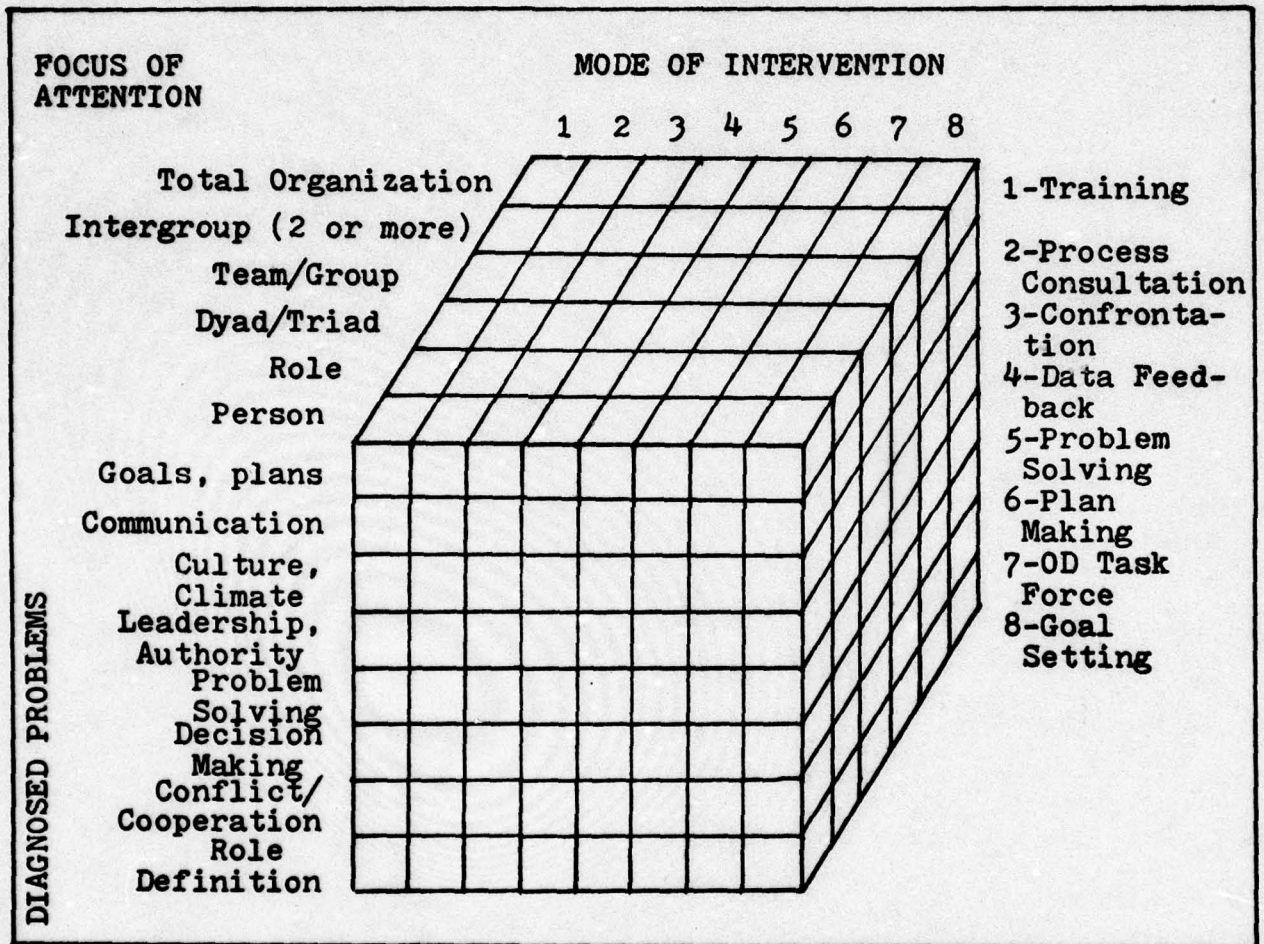


Figure 3. The OD Cube

vention as follows:

1. Training or education: procedure involving direct teaching or experience-based learning. Such techniques as lectures, exercises, simulation, and T-groups are examples.
2. Process consultation: watching and aiding ongoing

processes and coaching to improve them.

3. Confrontation: bringing together units of the organization (persons, roles, or groups) which have previously been poor in communication.

4. Data Feedback: systematic collection of information which is then reported back to the appropriate organizational units as a base for diagnosis, and solution intervention and implementation.

5. Problem Solving: meetings essentially focusing on problem identification, diagnosis, and solution intervention and implementation.

6. Plan making: activity focused primarily on planning and goal setting to replot the organization's future.

7. OD Task Force establishment: setting up ad hoc problem solving groups or internal teams of specialists to ensure that the organization solves and carries out plans continuously.

8. Goal Setting: activity which formalizes and institutionalizes the setting of individual, group, and organizational goals on a continuing basis.
[Miles and Schmuck, 1976:7-9].

While this classification scheme undoubtedly assists in the appreciation of the myriad of possible OD techniques available, it does not help in understanding how individual techniques are used. For example, the OD task force focuses almost exclusively on the total organization and as a result is applied to a "column vector" of diagnosed organization-wide problems. However, most of the other techniques are used in as many situations as (eight problems times six foci = 48) the cube indicates. While this may clarify the diversity of possible applications, the number of possible combinations does not allow sufficient distinction to be

made among the various modes of intervention.

The other solution to the classification problem will help resolve this limitation of the OD Cube. Its scheme "...rests on an attempt to determine the central, probable underlying causal mechanism of the intervention; that is, the underlying dynamics of the intervention that probably [emphasis added] are the cause of its efficacy" [French and Bell, 1973:107]. The word probably is emphasized because there is not universal agreement on the causal dynamics of any particular intervention. Some features of different, specific OD interventions are illustrated in Figure 4. Careful examination of this figure will reveal that some interventions are hypothesized to have more than one change mechanism (e.g., team building has three: feedback, awareness of changing sociocultural norms, and education). Such a situation is not surprising; in fact, given the dynamics of the OD Cube, it is expected.

Some discussion of the hypothesized change mechanisms used by French and Bell in constructing this figure is appropriate:

1. Feedback: this refers to learning new data about oneself, others, group processes, or organizational dynamics. Awareness of this "new information" may lead to change if the feedback is not too threatening.
2. Awareness of Changing Sociocultural Norms: often people modify their behavior, attitudes, values, etc., when they become aware of changes in the norms that are helping to determine their behavior. The awareness that..."we're now playing with a new set of rules" is here hypothesized to be a cause of changes in individual behavior.

Hypothesized Change Mechanism	Intervention Based Primarily on the Change Mechanism
Feedback	Survey feedback T-group Process consultation Organization mirroring Grid OD instruments Gestalt OD
Awareness of Changing Sociocultural Norms	Team Building T-group Intergroup interface sessions First three phases of Grid OD
Increased Interaction and Communication	Survey feedback Intergroup interface sessions Third-party peacemaking Organizational mirroring Management by Objectives Team Building Technostructural Changes Sociotechnical system
Confrontation and Working for Resolution of Differences	Third-party peacemaking Intergroup interface sessions Coaching and counseling individuals Confrontation meetings Organizational mirroring Gestalt OD
Education through: (1) New Knowledge (2) Skill Practice	Career and life planning Team Building Goal setting, decision making, problem solving, planning activities T-group Process consultation Transactional analysis

Figure 4. Intervention Typology Based on Principal Emphasis of Intervention in Relation to Different Hypothesized Change Mechanisms

3. Increase Interaction and Communication: increasing interaction and communication between individuals and groups may in and of itself effect changes in attitudes and behavior.

4. Confrontation: this term refers to surfacing and addressing differences in beliefs, feelings, attitudes, values, or norms to remove obstacles to effective interaction. Confrontation...actively seeks to discern real differences that are "getting in the way,"...and work on the issues in a constructive way.

5. Education: this refers to activities designed to upgrade (1) knowledge and concepts, (2) outmoded beliefs and attitudes and, (3) skills [1973:108].

While this latter classification scheme is somewhat more controversial because of its hypothesized causal mechanism of change, it does graphically depict the multiple emphasis found in many interventions.

The OD Practitioner (ODP)

Before focusing on the OD intervention that is the subject of the research effort (team building), it is important to gain an appreciation of the ODP: what he does, who he is, and the problems he faces. From the preceding discussion, it is evident that the ODP's tool kit is filled with many possible mechanisms for effecting change. Prior to choosing his tools, however, the ODP must identify the underlying forces or conditions that gave rise to the current state of affairs in an organization. This role--one of diagnosis--is often seen as one of the key roles of the ODP, but by no means the only role. Although a complete treatment of all the various aspects of the ODP role is beyond the scope of this paper, several topics will be included to allow an appreciation to be obtained of this vital human link between behavioral science theory and organizational change.

Roles of the ODP. The literature provides ODPs with

many roles, but three in particular are mentioned often: diagnostician, prescripitor, and facilitator or catalyst [Bowers, 1976; Bennis, 1969; Bowen, 1978; Browne, 1977; and Shepard, 1975]. Of these, the diagnosis role is usually asserted to be the most important.

Diagnosis simply put, is finding out what is going on in an organization. It is a process of collecting information in order to ascertain problems and provide a framework for change. Diagnosis is not without its problems, one of which was stated by Shepard as "...systems do not necessarily like being diagnosed. Even the term 'diagnosis' may be offensive" [1975:1]. Obviously the diagnostic role will require the ODP to establish a trusting relationship with the client that will allow probing without creating unnecessary resentment. After this relationship is established, the ODP must decide how to gather the requisite information. The literature reveals several methods for information gathering which have been summarized in Table III from the writings of Fordyce and Weil [1971], McGill [1977], and Lindell and Drexler [1979].

Once this information has been gathered, the ODP must call upon his values, experiences, and knowledge to diagnose the problems of the organization and prescribe appropriate treatments. The nature of the treatment(s) are ODP-dependent. Some practitioners have developed confidence in a few methods (or perhaps even a single one) which they have found appropriate for a wide variety of organizational problems. Other ODPs

Table III
Benefits and Limitations of Information-Gathering Methods

METHOD	BENEFITS	LIMITATIONS
1. Survey Questionnaire	<ul style="list-style-type: none"> a. Economical b. Lends itself to statistical use c. Provides anonymity d. Not time consuming e. Wide acceptance f. Easy to handle many respondents 	<ul style="list-style-type: none"> a. Forced-choice responses may miss real feelings b. Rigid, canned quality c. Impersonal d. Impreciseness of scale
2. Interviewing (Individuals)	<ul style="list-style-type: none"> a. Facilitates private expression b. May help develop trust c. In skilled hands, may invite ideas and emotions not previously formulated 	<ul style="list-style-type: none"> a. Time consuming b. Requires skilled interviewers c. Inter-rater bias problem d. Expensive e. Can be threatening
3. Direct Observation (Groups)	<ul style="list-style-type: none"> a. Group interaction often produces rich information b. More economical than interviews c. "Admits the rumble of humanity into the ivory tower" d. Allows feelings and attitudes to be observed 	<ul style="list-style-type: none"> a. Requires skilled group leader b. Interpretation often difficult c. Requires trust before it is successful

may feel comfortable with a large sub-section of methods from the OD Cube. Regardless of their orientation, a preeminent "principle of congruence" has been suggested:

For constructive organizational change to occur, there must exist an appropriate correspondence of the

treatment...with the internal structural and functional conditions of the organization for which change is intended. Since by definition these internal conditions preexist, this means that treatments must be selected, designed, and varied to fit the properties of the organization. [Bowers, Franklin, and Pecorella, 1975:393].

These authors go on to describe one process for achieving congruence. Although too lengthy to be included here, the interested reader is referred to pages 400-409 of the cited work.

Once this "prescriptive" stage is finished, the ODP must assume the responsibility for his prescribed treatment. Much of the OD literature characterizes this phase as the one in which the ODP becomes the facilitator or catalyst for change. Inherent in this view is the notion that the client unit "...contains all the capacity necessary to cope with its own problems, provided that it is aware of both of these things (capacity and problems)." [Bowers, 1976:55]. The exact role of the ODP in this stage varies with the specific method of intervention selected, but some authors contend that for the intervention to be successful, it is necessary for the client group to develop ownership of the prescribed OD program [Adams, 1974]. So in this case at least, the ODP must possess a modicum of sales ability.

Characteristics of ODPs. Little empirical research has been published on the characteristics and skills of effective ODPs [Beer, 1976; Spencer and Cullen, 1978]. Although this situation may at first appear surprising given the pivotal role of the change agent in OD approaches to change, upon reflection the reasons for the lack of these data are more

apparent.

First of all, one of the main reasons for the lack of data on change agent effectiveness is the absence of any established criteria for determining who is a part of the OD profession. Although several movements have been initiated to develop certification criteria for OD consultants, none of these attempts have enjoyed much success [Hogan, 1976; Adams, 1975; Jones, 1977; Tannenbaum, 1976; Varney, 1978]. Consequently, almost anyone can declare himself an ODP without fear of running afoul of any legal restrictions. Since there is no centralized establishment for certifying ODP competence, it is difficult to even identify all the ODPs, much less to collect data on them.

Secondly, ODPs possess a variety of backgrounds. Although several universities are now offering advanced degree programs in OD, what little data that is available in the literature on ODP characteristics indicates that practicing consultants come from widely varying educational backgrounds. Academic degrees in business, social science, and even physical science disciplines are only slightly less common than behavioral science backgrounds [Ganesh, 1978; Armenakis, 1976; Prakash, 1968]. Given this diversity of backgrounds among "successful" ODPs, it is difficult to establish what particular academic training predisposes one to become an effective OD consultant.

A related issue is the definition of ODP effectiveness. As indicated earlier, OD interventions rarely involve objectives that are conducive to measurement, such as productivity

increases. Instead, OD is often aimed at interpersonal processes where attitudinal perceptions are paramount. It is difficult to measure such perceptions, and even more difficult to separate the efficacy of the intervention from the competence of the practitioner. The client who has invested substantial resources and is committed to an OD program is not a particularly good source of effectiveness data [Connor, 1977; White and Mitchell, 1976]. Consequently, effectiveness ratings by peers are often mentioned in the literature [Pfeiffer, 1976; Mitchell, 1974], but such practices can only lead to increasing the perception of "clubbiness" that surrounds the OD profession. As a result, the issue of ODP competence is largely unexplored territory [Spencer and Cullen, 1978].

While these factors are important in understanding the reasons for the paucity of empirical data on change agent competence, this situation is slowly changing. Several researchers have attempted to identify various personality traits and skills they believe to be associated with consultant effectiveness. These characteristics are summarized in Table IV.

Although there have been no large scale attempts to confirm all the relationships that are listed in Table IV, the characteristics noted might be used to form an interesting hypothesis. It appears that critical characteristics associated with ODP "success" include a strong belief in the values and assumptions surrounding OD, and the determination to acquire skills necessary to conduct interpersonal interventions.

Table IV
Characteristics and Abilities of Change Agents
Related to Effectiveness

Positively Related

- Positive attitude toward intervention success [McClelland, 1975; Argyris, 1970]
- Knowledge of Organization theory [McClelland, 1975]
- Ability to create a trusting relationship with clients
 - Accurate empathy [Truax et al., 1966; McClelland, 1975]
 - Nonpossessive warmth [Truax et al., 1966]
 - Genuineness [Truax et al., 1966]
 - Nondirectiveness [Kolb et al., 1970; McClelland and Winter, 1969]
 - Neutrality [Kochan and Dryer, 1976]
- Attention to detail [McClelland, 1975; Spencer and Cullen, 1978]
- Critical thinking [McClelland, 1975; Spencer and Cullen, 1978]
- Emotional stimulation [Lieberman et al., 1973]
- Marketing skills [McClelland, 1975; Dyer et al., 1970]
- Goal setting [Kolb et al., 1974; McClelland and Winter, 1969]
- Management skills [McClelland, 1975]
- Specific need strength; moderate N ach; moderate to high N aff; moderate N pow [McClelland, 1975]

No Relationship

- Change agent training [Franklin, 1976; Spencer and Cullen, 1978]
- Demographic variables [Ganesh, 1978; Browne, 1973; Franklin, 1976]
- Personality traits [Varney, 1978]

Negatively Related

- Previous experience in the personnel field [Franklin, 1976]

Contradictory Relationships

- Work experience [Franklin, 1976; Prakash, 1968]

Although this hypothesis awaits empirical validation, it is consistent with the limited data currently available, and it does explain why ODPs are the product of widely diverging backgrounds. Technical competence in organizational theory does not appear to be as important as a generally positive view of people, or a facility in dealing with organizational groups.

ODPs: Internal versus External. Some OD theorists, like Bennis, strongly urge that ODPs be external to the client system. Although admitting that this is another one of those controversial issues:

...Generally speaking, certainly during the beginning phases, outside change agents are necessary. This is true for a variety of reasons, not the least of which is the conventional wisdom that an outsider carries more weight. More to the point, I suspect, is that the external consultant can manage to affect--again, especially at first--the power structure in a way that most internal change agents cannot. [Bennis, 1969:12].

A similar belief is expressed by Browne et al. in an article which reports research results on the "marginality" of internal and external ODPs. "Marginality" in their definition is a characteristic of someone "...who stands the boundary between two or more groups that have different value systems, goals, and behavior patterns." They take a positive view of marginality, stating that "...marginality is characterized by personal qualities of neutrality, openmindedness, and adaptable information-processing that can be beneficial both to the individual and to the organization...." Their primary finding

was that external ODPs indicate marginal orientations (a desirable trait) significantly more often than do internal ODPs. They ascribe this finding to the fact that "the employer-client often seems to see the internal OD practitioner's marginality as 'unnatural' or even 'disloyal'" [Browne, Cotton, and Gloembiewski, 1977:494-503]. Thus, the prevailing view seems to be that external change agents can retain a perspective and a detachment that an internal change agent cannot, although the intervention opportunities of the internal ODP are unique if the proper organizational relationship can be obtained.

ODP Value Dilemmas and Problems. In reviewing the potential for conflict between the humanistic and democratic values of most ODPs and the authoritarian, efficiency-oriented values of the managerial clientele most often served by change agents, several authors have noted the potential for serious value dilemmas. Walton [cited in Bowen, 1977:546-7] has concluded that these dilemmas can arise from five types of inconsistencies:

1. An inconsistency may exist between the goals and strategies of the client and the values of the consultant.
2. The client's actions in implementing the OD program may be inconsistent with the goals and values of the consultant.
3. There may be a difference between the consequences of the intervention and the consultant's personal values.
4. There may be a difference between the consultant's behavior and accepted professional standards.

5. The consequences of an intervention may be inconsistent with the values generally identified with OD.

Argyris agrees:

The complexity involved in being an effective OD professional is not to be minimized. His is one of the most difficult roles in our society [emphasis added]. Helping anxious executives to change basic values, ingrained behavior, and important aspects of culture that support these values is not easy.... [1971:175].

Given the inherent difficulty of the ODP's role, the lack of means to measure all but the most substantive organizational change, and the relatively long time required for organizational change to manifest itself, the OD profession is "...made to order for commercial mischief, both purposeful, and unintentional" [Bowers, 1976:54]. Argyris believes the role of the ODP in our society to be about where the role of the medical doctor was in the early 1700's, and he finds fault with the current training and education of many ODPs [1971]. Bowen also uses the analogy of the medical profession when he states:

Perhaps the greatest single defect in all current concepts of OD is that they assume that change is necessary and desirable. They encourage the consultant to approach OD as a "change agent".... A good doctor does not find something wrong with each patient, and OD professionals will experience fewer value conflicts if they define their function so that they are not tempted to perform organizational surgery on every client. [1977: 555].

In summary, the ODP is in an unenviable position within his own profession. Even though his tool kit contains an assortment of potent instruments, his profession has often not provided him with the training necessary to diagnose or treat the assortment of maladies he is likely to encounter.

Worse yet, his patient is unlikely to be of much assistance in the diagnosis or the course of treatment, and the treatment (once chosen) is unlikely to produce measurable effects (if any) for several years after it was started.

Team Building Interventions

Now that the characteristics, values, and dilemmas of change agents have been highlighted, it is appropriate to examine the nature of the specific OD change mechanism that is the focus of the thesis--team building.

"Team building is the single most popular approach to OD used today" [McGill, 1977:77]. Not only popular, its use is widespread throughout industry, the public sector, the military, and even county jails [French and Bell, 1978; Goodman, 1978; Manley and McNichols, 1977; Umstot, in press; Patten, 1977; Crockett, 1970; Gluckenstern et al., 1977]. The definition of team building usually includes problem diagnosis and problem-solving workshops conducted with an intact work group or "team." The term "team development" reportedly evolved from early work by McGregor [in 1964] at Union Carbide where one of his explicit tasks was to build an effective management team [Bennis, 1969]. The goals of this particular intervention are representative of the general goals of most team development programs [McGregor, 1967]:

1. Understanding, mutual agreement, and identification regarding the goals of the group.
2. Open communication

3. Mutual trust
4. Mutual support
5. Effective management of conflict
6. Developing a selective and appropriate use of the team concept.

From this list it is apparent that the primary focus of team development is improvement and increased effectiveness of the various teams within the organization. French and Bell state that to accomplish this objective, team building interventions "...are typically directed toward four major substantive areas: diagnosis, task accomplishment, team relationships, and team organization process" [1973:113]. These four varieties of team building interventions are depicted in Figure 5. The terms "family groups" and "special groups" are critical to understanding this figure. Family groups are intact, permanent work teams composed of a boss and his subordinates; special teams are newly constituted teams (due to such phenomena as reorganization, merger, task forces, etc.). The primary differences between team building efforts in these groups, however, is more a matter of degree than substance.

Team building sessions are usually initiated by the supervisor (the head of the team) who, together with the consultant, decide on the scope and duration of the team building activities. The consultant, in turn, has several options in generating data for the initial session (the diagnosis phase discussed earlier). The most common are interviews and surveys,

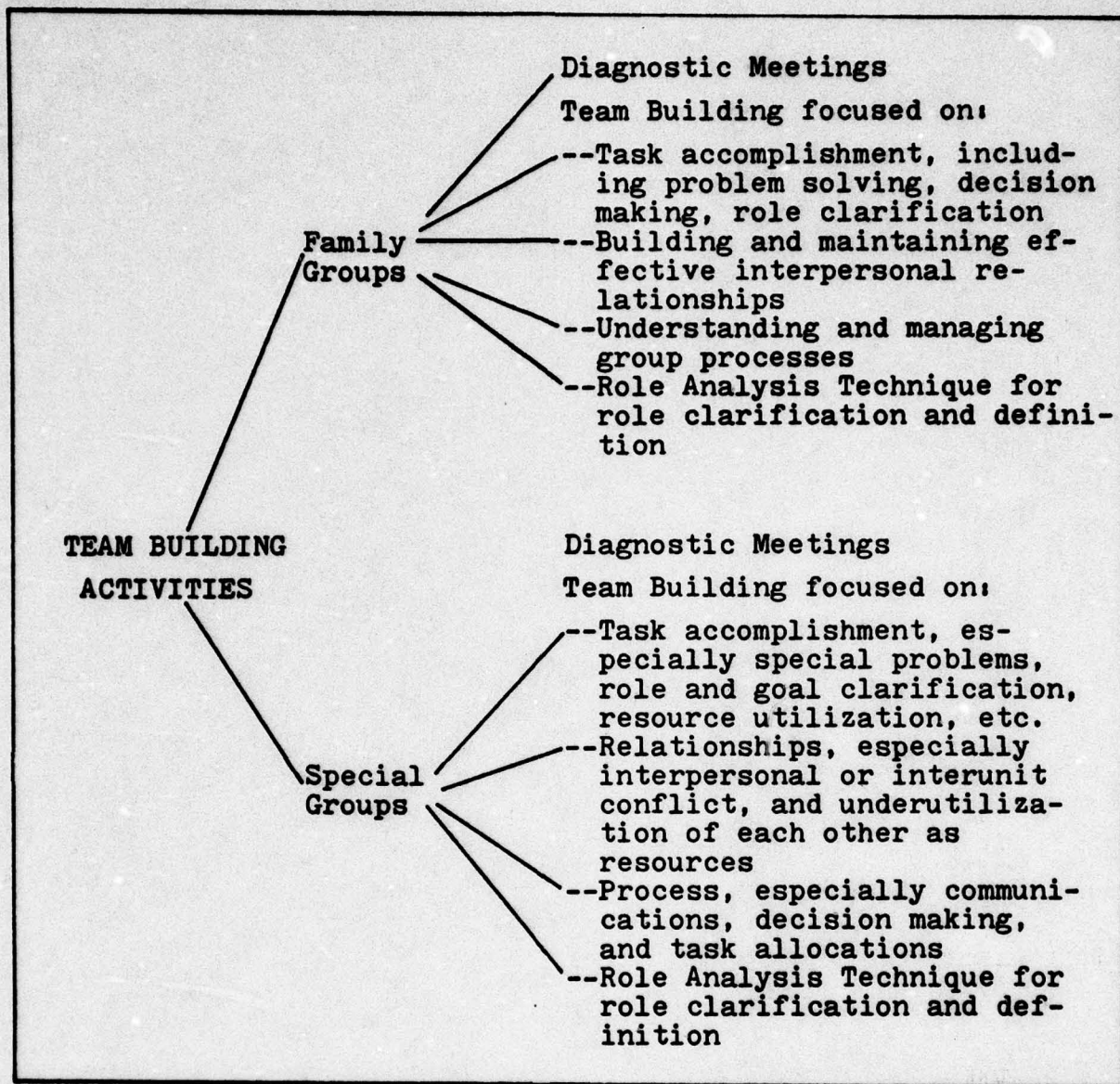


Figure 5. Varieties of Team Building Interventions

although some consultants use unstructured initial sessions which are focused on surfacing the problems that must be solved. Beckhard makes a particular point, though, that the major purpose of the team building effort should be defined by the team, not the interventionist [Beckhard, 1972]. The major output

of all these efforts is the creation of an action-plan agreed upon by group consensus which detail member's responsibilities for attainment [McGill, 1977].

The popularity of team building as an intervention apparently stems from two important distinctions which separate it from other popular OD interventions. First, it concentrates on intact work groups, usually directly in the organizational setting. Consequently, there is no transfer of training problems like those encountered in off-site interventions. Team members mutually reinforce each other because of emphasis on the group, rather than on changes in individual behavior. Secondly, client groups experience sustained changes in many team development programs, and perhaps equally as important, client groups in a team process seem better able to eliminate their dependency on the ODP--an important consideration from the viewpoint of top management given the often considerable expense of team building efforts.

The Effectiveness of OD Interventions

In reviewing the nature of OD, the reader may have wondered how effective OD is in accomplishing organizational change. The question is a fair one, but the answer is less than satisfactory. Although there has been some recent emphasis on measuring the amount of change induced by OD (primarily in response to criticism that OD is not a science), empirical research on this topic is plagued with validity problems. Two problems are especially prevalent.

Problems Associated with Current OD Effectiveness

Research. Of the numerous problems associated with evaluating reports of OD effectiveness, the most common fault is the absence of an acceptable research design. One author reviewed 160 evaluation studies on OD appearing before 1975 and could find only 35 that could be said to be even reasonably empirically based or scientific in nature [Porras and Berg, 1978]. Other researchers report similar results [Cummings and Malloy, 1977; White and Mitchell, 1976; Morrison, 1978; Pate, 1977]. Even those studies which used some sort of research design frequently used a quasi-experimental design that did not include a control group. That shortcoming gives rise to the possibility of alternate causes for any observed changes [White and Mitchell, 1976; Campbell and Stanley, 1963]. Further, many of the statistical analyses presented were relatively crude; others were invalid because of the lack of control for the extremely small sample sizes often used [Porras and Berg, 1978; Morrison, 1978].

The second major problem associated with studies of OD effectiveness is the prime cause for the occurrence of so many studies with poor statistical technique. The problem is measurement. Almost all researchers performing work in this area worry about how to measure organizational change, but few good methods have surfaced. Consequently, most researchers are reduced to using self-reported perceptions of change, often on an "ex-post facto recall" basis. This has led to a situation where over-

reliance on the questionnaire is becoming a problem [Cahn, 1977; White and Mitchell, 1976; Porras and Berg, 1978; Lindell and Drexler, 1979].

Many OD researchers have offered suggestions on how experimentors can improve their research methods [Cummings and Malloy, 1977; Morrison, 1978; Kahn, 1974], and there are some indications that increased emphasis is being placed on properly selected control groups, elimination of experimenter biases, good statistical technique, and other methodological issues. However, the present state of OD research makes one hesitant about drawing conclusions concerning the effectiveness of OD interventions without careful scrutiny of each reported study.

Selected Research Results. Despite these cautions, there are several research studies on OD effectiveness in the literature that merit reporting. While these studies usually conclude that OD is responsible for substantial organizational impact, the facts surrounding this situation may not be as impressive as they first appear. As Bowers states, "Journals and professional societies simply are not interested in accounts of efforts in which 'nothing happened'" [1976:52]. There are sufficient reported cases of unsuccessful interventions, though, to allow a comparison of characteristics among those that worked and those that did not. Franklin authored one such comparative study, and his summary results are contained in Table V. The reader will notice that three general areas serve to differentiate successful from unsuccessful OD efforts. In Franklin's

Table V
 Characteristics of Successful and Unsuccessful Change in Organizations,
 Including Nondifferentiating Characteristics
 [Franklin, 1976]

CATEGORY	NONDIFFERENTIATING CHARACTERISTICS	SUCCESSFUL	UNSUCCESSFUL
Organization's Environment	Geographical location	Expanding market	Steady market
	State of the industry	Labor drawn from suburban areas	Labor drawn from towns
	Scope of the market	Higher pay rate	Lower pay rate
Organizational Characteristics	Size	More levels of hierarchy	Fewer levels of hier- archy
	Changes in size	Heavy industries	Office and sales organiza- tions
		Innovative reputation	Noninnovative reputation
Initial Contact	Position of contact person		Nonunion
			Insurance industry
Entry and Commitment	Desire to be seen as innovative	Interest based on prior contact with R&D staff	Interest not based on prior contact with R&D staff
	Commitment for a resurvey	Commitment to survey feedback	No commitment to survey feedback strategy
	Commitment for a re- structuring of the organization	Greater support from top manage- ment	Lesser support from top management
	Commitment to survey		

Table V (Con't)

CATEGORY	NONDIFFERENTIATING CHARACTERISTICS	SUCCESSFUL	UNSUCCESSFUL
	feedback <u>plus</u> process consultation	Expression of a specific problem	Expression of a general problem Not motivated by desire to experiment with new ideas
Data Gathering	Total population data collections	More recent initiation of development effort	
Internal Change Agents (ICAs)	ICA selection Knowledgeability of organizational functioning Skill levels Value orientations Change agent style Research posture	ICAs possessed assessment prescriptive skill More care taken in ICA selection	Did not possess this skill Less care taken in ICA selection Previous work experience in personnel department
External Change Agents (ECAs)	ECA selection Care of ECA selection Knowledge base Skill levels Types of skills Non-change agent experience Research posture		

Table V (Con't)

CATEGORY	NONDIFFERENTIATING CHARACTERISTICS	SUCCESSFUL	UNSUCCESSFUL
Termination Procedures	<p>Change agent style</p> <p>Previous ECA experience</p> <p>Pace and planning of termination</p> <p>Reasons for termination</p> <p>Attitude towards effort at termination</p>		

words:

1. Organizations that are more open to and involved in adjusting to change are more likely to be successful in their OD effort than those that are more stable and status quo oriented.
2. Internal change agents who are more carefully selected, did not receive training prior to the current OD effort, and who possess assessment-prescriptive skills are most evident in the successful organizations.
3. More specific interest in and greater commitment to the OD projects are associated with successful change [1976:471]. [emphasis in original]

These results may have several implications for organizations contemplating an OD program. First, organizations must be ready and willing to change. Those organizations that place a premium on not "rocking the boat" may have difficulty in creating a climate in which OD can begin to be successful. Secondly, careful selection of change agents is important. As noted earlier, the use of ODPs with values congruent with those of the organization, and who possess a complement of interpersonal skills are more likely to be successful. Lastly, (and perhaps most importantly) is the necessity to secure top management ownership of the OD program. Mere benign neglect in this case will not suffice. Without enthusiastic, long-term commitment by top management, the success of the OD intervention will always be in doubt.

In addition to this study, several researchers have compiled a compendium which analyzes the reported efficacy of all available studies of an empirical nature. Bowers' study [1973] used data collected from more than 14,000 respondents in 23

organizations in a longitudinal study assessing the impact on organizational functioning of four broad categories of OD Interventions, plus two control treatments (data handback and no treatment). The results indicated that OD interventions which concentrated on interpersonal changes in an intact work setting were the most successful type of OD intervention. Interventions which concentrated more on the task, or the work itself, were less effective, and interventions which removed participants from the work setting were the least effective of all [Bowers, 1973].

In a more recent study by Porras and Berg [1978], 35 OD research reports were used to accomplish a similar analysis. Tables VI and VII contain a summary of some of their more important findings. These authors have categorized OD change according to its effect on two classes of variables: process variables (people variables--openness, self-awareness, work

Table VI
Impact of OD on Outcome Variables

<u>Variable Level</u>	<u>Number of Studies</u>	<u>Average Change Rate</u>
Group	8	63%
Organization	12	47%
Individual	14	42%
Leader	3	---
TOTAL	22	51%

Table VII
Impact of OD on Process Variables

<u>Variable Level</u>	<u>Number of Studies</u>	<u>Average Change Rate</u>
Individual	10	62%
Group	11	49%
Leader	20	45%
Organization	27	36%
TOTAL	35	46%

facilitation, motivation, etc.) and outcome variables (performance variables--profits, costs, productivity, efficiency, etc.).

In interpreting the results of Tables VI and VII, the following definitions of "Variable Level" are used:

OUTCOMES

Individual: individual variables consisted of two classes: (a) individual performance ratings; and (b) various distinct measures of satisfaction.

Organization: economic performance and workforce characteristics.

Leader: leader performance variables

Group: group performance variables (length and quality of meeting, etc.).

PROCESSES

Individual: interpersonnal and behavioral measures.

Organization: organizational climate, and various people and task oriented measures.

Leader: Task and people oriented behaviors.

Group: Intergroup, task, and people oriented measures. [Porras and Berg, 1978:258-262].

In summarizing their findings, the authors concluded that OD affects positively both individual and leader attitudes somewhat more often than individual and leader performance. "Conversely, group and overall organization performance tend to be affected slightly more often than group and organizational processes." [p.258]. They also find support in these data for the perception that OD has more impact on individuals as individuals, and thus OD provides more benefit to the individual in the organization than the organization itself.

Another interesting finding of the Porras and Berg study is that intensity of the OD intervention is positively associated with intervention success. They reported that consultant involvement over a period of 13-24 months appeared optimum, with involvement periods both shorter and longer than this optimum resulting in lower reported rates of change. [p.262-263].

Finally, they noted that overall satisfaction changed positively only 38% of the time it was investigated. This finding is important because many people assume that the main impact of OD is to "make people happier and more satisfied." This assumption is not supported by their data, nor is the commonly held belief that OD has its major impact on organizational processes and relatively little impact on outcomes. They reported that OD affects outcomes equally with processes.

Unfortunately, Porras and Berg's study is a good example of a study reporting on OD effectiveness that suffers from poor statistical rigor. At least these authors are candid

enough to admit that "...all these findings represent trends in the data, not statistically tested relationships" [1978: 262].

Summary

For the purpose of this paper organization development (OD) is the process of planned organizational change, facilitated by a professional change agent, to increase the effectiveness of an organization by emphasizing the human variables that comprise it. The values and assumptions of OD are basically humanistic and are derived from McGregor's Theory Y and Likert's System Four orientations. These humanistic values are used to develop goals for OD interventions that are directed toward increasing interpersonal competence, building trust and collaboration, and creating an environment where conflict is managed rather than suppressed or denied.

In OD theory organizational change is induced by an OD practitioner (ODP) who is also referred to as a "consultant," "change agent," or "interventionist." His role is one of diagnosis, prescription, and facilitation. The tools he possesses to accomplish these tasks are many and varied, ranging from "sensitivity training" on one extreme to "job redesign" on the other.

Studies which have attempted to measure the effectiveness of some OD interventions are a rather recent phenomena in the literature, but they are for the most part inconclusive.

Empirical research in this area has been hampered by small sample sizes, poor research designs, lack of statistical control, and the impreciseness inherent in measuring organizational change.

III Research Methodology

Introduction

In reviewing previous studies on the effectiveness of OD interventions in the last chapter, it is apparent that many problems beset researchers in this area. Mindful of the past shortcomings of OD research, this assessment of the effect of the team building intervention on AFFDL was designed to eliminate or minimize as many of these problems as possible. Toward this end, a longitudinal, quasi-experimental research design employing control groups was used to eliminate many of the alternative causes for any observed change; standard, validated measures of organizational performance and process variables were used whenever possible; and, statistical control was employed to ensure that any observed changes were significant and not due to sampling error. This chapter provides a review of these topics, a description of the various statistical and analytic techniques that were employed, and an examination of the various measures upon which the investigation of organizational change was based.

Research Design

The research design employed in this study was a quasi-experimental design using the four main product divisions of AFFDL as subjects for the research. The Flight Control (FG)

and Vehicle Equipment (FE) divisions* have been actively involved in the team development program conducted by Dr. Lehner since 1976. The other two divisions, the Aeromechanics division (FX) and the structural mechanics division (FB) have not been formally involved in the program due to a conscious decision of their directors to avoid such an association. A longitudinal comparison of FB and FX (as the control groups) with FG and FE (the treatment groups) is the central theme of this thesis.

Using the symbology of Campbell and Stanley [1963], the quasi-experimental design that was used in this research is depicted below in Figure 6.

<u>Division</u>		<u>Jan 78</u>		<u>Jan 79</u>	
FE	X	O ₁	X	O ₂	X=Treatment
FG	X		X	O ₂	

FX		O ₁		O ₂	O=Observation
FB		O ₁		O ₂	

Figure 6. Quasi-Experimental Research Design

The Sample. The AFFDL is a multi-million dollar research and development laboratory, located at Wright-Patterson Air Force Base near Fairborn, Ohio. It is the Air Force focal point for exploratory and advanced development programs in aerospace flight vehicles (aircraft and missiles). Approximately 1000 people work in AFFDL, with scientists and engineers

* A description of all the divisions is presented on page 61 under the heading "The Sample."

(S&Es) comprising almost half this total. A brief description of the four product divisions follows:

Structural Mechanics (FB): the approximately 280 military and civilian personnel of this division are primarily concerned with the safety, reliability, cost, and performance associated with new aerospace vehicle structures.

Vehicle Equipment (FE): this division is responsible for advancing technology on flight vehicle equipment and subsystems including such items as landing gears, windshields, crew survivability, and environmental control. Approximately 150 personnel work in FE.

Aeromechanics (FX): the approximately 270 personnel of FX are involved in formulating and directing development programs in aerodynamics, thermodynamics, performance analysis, and technology integration for advanced military aircraft and missiles.

Flight Control: this division acquires and employs advanced technology to analyze, design, and support the flight control needs of present and future military aircraft. Approximately 200 personnel work in FG. [AFFDL Brochure].

Except in size, the composition of each of these four divisions is quite similar. Approximately eighty percent of the workforce consists of civilians employed by the Department of the Air Force. Military personnel fill various management, technical, and administrative positions within the laboratory. Demographic data extracted from the 1979 data sample (see next section) are provided in Table VIII. The main difference exhibited among the divisions is an apparent lower average age for employees in division FG. The effect of these younger employees is also manifested in correlated variables such as civilian grade, and the length of time assigned to both the laboratory and the division. The impact of this difference is examined in

Table VIII
Demographic Data for AFFDL (1979 Sample)

<u>Question</u>	<u>Description</u>	<u>AFFDL Total</u>	<u>FX</u>	<u>FB</u>	<u>FE</u>	<u>FG</u>
1	Age Category ^a	4.34	4.78	4.65	4.64	3.41
2	Grade Category					
	Military ^b	8.84	8.45	7.92	9.36	9.18
	Civilian ^c	3.95	4.44	3.85	3.88	3.65
3	Years in Division ^d	5.54	6.05	5.85	5.70	4.72
4	Length Assigned Lab ^e	3.36	3.64	3.81	3.46	2.62
5	Educational Level ^f	4.79	5.07	4.63	4.51	4.90
6	Position					
	S&Es	223	59	52	39	72
	Technicians	63	15	25	16	6
	Clerk/Steno	47	6	15	10	16
	Group Leaders	41	12	10	9	10
	Branch Chiefs	17	3	4	4	5
	Other	<u>21</u>	<u>5</u>	<u>2</u>	<u>5</u>	<u>7</u>
	TOTAL	412	100	108	83	116

^aAn average of 3.0 represents 30-34 years; 4.0 represents 35-39 years; 5.0 represents 40-44 years

^bAn average of 8.0 represents TSgt-CMS; 9.0 represents 1st or 2nd Lt; 10.0 represents Capt

^cAn average of 3.0 represents GS 8-11; 4.0 GS 12; 5.0 represents GS 13

^dAn average of 4.0 represents 2 years but less than 3; 5.0 represents 3 years but less than 4; 6.0 represents 4 years but less than 5

^eAn average of 2.0 represents 2-5 years; 3.0 represents 6-10 years; 4.0 represents 11-15 years

^fAn average of 4.0 represents BS degree; 5.0 represents some graduate work (no degree)

Chapter IV.

Data Collection. The questionnaire used in this research was designed to measure such organizational and individual factors as job satisfaction, job motivation, productivity, and organizational climate. Between Christmas 1977 and New Years Day 1978, 583 questionnaires were distributed to all personnel within three divisions (FX, FB, and FE) except division chiefs, division staff, and unionized technicians. By mid-January 1978 380 questionnaires (354 usable) were returned to the researchers. A second measurement (using the same instrument) was obtained one year later from four divisions (FG was added at the request of the laboratory commander). Of the 663 questionnaires distributed, 426 (415 usable) questionnaires were returned to the researcher within the cutoff time specified. The response rate to this survey (1978: 65 percent; 1979: 64 percent) is considered quite good for a voluntary survey of this nature.

Care was taken in the second measurement to ensure that only those employees who remained in their respective divisions for the entire year were provided an opportunity to complete the instrument. Instruments were not distributed to new employees or to employees who transferred divisions during the year. Completion of the instrument by AFFDL employees was completely voluntary, and anonymity was guaranteed. Consequently, the "longitudinal" nature of the methodology applies only in the collective sense of division membership; identification of individual respondents from year to year is not

possible.

Assumptions. One assumption was necessary in order to use this research design and associated statistical techniques: the responses to the survey instrument are valid and devoid of any systematic biases.

Limitations. In like manner, several limitations are associated with this particular research design. A discussion of each limitation and its possible impact on the research follows:

1. Random selection and assignment of personnel to each of the four divisions was not possible. This limitation is the basis for downgrading the design from true experimental to a quasi-experimental design. Although Campbell and Stanley [1963] state that the design that was used will control for most of the sources on internal invalidity, two potential problems still remain. The first of these is the interaction of selection with maturation of the subjects which occurs when one group has a higher rate of maturation or autonomous change than another. Given the demographic similarity of the AFFDL divisions, this potential source of invalidity is considered unlikely, but further examination of its likelihood is deferred until Chapter IV. The second potential source of internal invalidity for this research design is regression toward the mean. This would be a potentially serious source of experimental error if any of the comparison divisions were chosen on the basis of extreme behavior on correlated effectiveness measures. AFFDL

representatives familiar with the four divisions have assured the researcher that such is not the case.

2. Since each respondent was guaranteed anonymity, paired-sample follow-ups of individual responses are not possible. This limitation primarily affects the degrees of freedom associated with various statistical procedures; it limits the statistical power of some of the tests of organizational change over the two measurements, but this does not adversely affect the results.

3. Although FX and FB do not formally participate in the team building program, a few members of these divisions may have been exposed to OD sessions through laboratory committees which meet on occasion with the external change agent. These contacts with OD could result in some "treatment spill-over" effect, but the infrequent nature and short duration of such contacts mitigate against any substantial effect.

4. A pre-OD baseline measurement of the laboratory was not obtained. As previously noted, the OD program within AFFDL had been in effect about two years before the first (1978) measurement was obtained. Consequently, a complete analysis of the overall effect of the team development program cannot be made with absolute certainty. Instead, longitudinal change can be measured in variables associated with the change model described in the introduction to this thesis which includes time as an intervening variable. During the course of the data analysis differences among the divisions on the various cri-

terion variables (for either observation) are noted in order to assess the impact of this limitation.

Questionnaire

The survey instrument used in this study was developed by Stahl, McNichols, and Manley [1978] based on the expressed goals of the team development program at AFFDL, and a multivariate model proposed by Kilman and Herden [1976] for evaluating the impact of OD interventions on organizational effectiveness. The instrument consisted of three parts (a copy of the instrument is included in Appendix A):

Part A (seven items) consisted of demographic questions designed to collect the data displayed in Table VII.

Part B (38 items) collected information on job satisfaction, job motivation, and organizational climate. The scales for each of these measures is addressed separately.

Part C (13 items) addressed productivity and nature of work questions for scientists and engineers (S&Es) only. One part of this section contained questions designed to allow identification of how much of an individual S&E's time is spent on various laboratory activities (supervision, technical support, administration, etc.). The other part was designed to measure quantitative output of common technical products monitored in the laboratory.

Measurement Scales

Rather than analyze changes in individual questions over

the one year time period between measurements, various composite measures were used. Some standard measures were contained in the instrument (thus avoiding problems of validity and reliability), but in instances where such measures were not available composite measures were constructed by the researcher using factor analytic techniques. For these constructed measures a limited validity and reliability analysis was conducted. This section deals with both the standard and constructed measures that were used in this analysis.

Job Satisfaction. Hoppock's [1935] job satisfaction measure was used to obtain a respondent's overall job satisfaction level. It is a four question (Question 8-11 in the instrument) global satisfaction measure that has received validation in research with samples from both the military and industry [McNichols, Stahl, and Manley, 1978]. The job satisfaction score is obtained by summing responses to the four questions (giving each question equal weight), yielding a scale score between four and 28.

A principal component factor analysis (PA1) [Nie et al., 1975] of the four Hoppock questions using the combined responses of the two-year sample yielded the following results: the first principal component explained 70.3 percent of the total variance in the combined sample and is the only factor with an eigenvalue greater than 1.0. As indicated in Table IX, the factor loadings on the retained factor are high, ranging from .78 to .90, and are nearly of equal magnitude. Therefore,

Table IX
Factor Loadings and Intercorrelations of the
Four Questions Comprising the Hoppock Measure

<u>Question</u>	<u>Factor Loading</u>	<u>Intercorrelations (N=719)</u>			
		<u>8</u>	<u>9</u>	<u>10</u>	<u>11</u>
8	.86	1.0	.72	.58	.59
9	.90		1.0	.60	.67
10	.78			1.0	.46
11	.81				1.0

Hoppock's equal weighting procedure appears to be very near the best that can be done in the sense of capturing as much of the variance in this sample as possible. The zero-order intercorrelations among these questions are also quite high, which is a further indication of the validity of this measure for this sample [Cronbach and Meehl, 1955].

Job Motivation. Patchen's [1965] job motivation measure was used to describe the respondent's devotion of energy to job tasks. Patchen's index is formed by adding the responses to the four questions (Questions 12-15) after reversing the polarity of Questions 14 and 15. The resulting scale score can vary between four and 20.

The four questions in this measure were factor analyzed as in the Hoppock measure. Only one factor with an eigenvalue greater than 1.0 was obtained, and it accounted for 56.6 percent of the variance in the responses. The loadings for the four questions are contained in Table X.

As in the Hoppock measure, the factor loadings are quite

Table X
Factor Loadings and Intercorrelations of the
Four Questions Comprising the Patchen Measure

<u>Question</u>	<u>Factor Loadings</u>	<u>Intercorrelations (N=719)</u>			
		<u>12</u>	<u>13</u>	<u>14</u>	<u>15</u>
12	.76	1.0	.56	.38	.39
13	.78		1.0	.43	.38
14	.75			1.0	.49
15	.72				1.0

high and nearly identical in magnitude, validating for this sample Patchen's procedure of simply adding the responses to the four questions. The reader will note, however, that the intercorrelations among the four questions are somewhat lower than that observed for the Hoppock measure. A comparison with Patchen's data [1965], though, revealed that the intercorrelations obtained in this sample are higher than those he obtained with the sample he used to develop his measure.

Organizational Climate. As noted in Chapter II, the measurement of organizational change is beset with problems--measurement problems in particular. One of the prime reasons for the difficulty in measuring the effect of OD interventions on organizations is the difficulty in defining organizational variables which properly reflect the values, attitudes, and perceptions of the people in the organization. For over 25 years the term "organizational climate" has been applied to this concept, yet researchers are still vehemently debating

exactly what it is, what it is not, how it can be operationalized, and what is its usefulness. While these issues are much too complex to be dealt with at length in this thesis, organizational climate (OC) and its measurement are central to this research effort. For this reason a short summary of OC issues directly relating to the current research effort is presented in Appendix B. Those readers unfamiliar with the generally obscure nature of OC are urged to read Appendix B before reviewing the variables that were constructed from the OC questions in the survey instrument.

Questions 16 through 45 of the survey instrument were designed to collect data on a variety of OC variables such as the supervisory, work group, communication, and reward qualities perceived by AFFDL personnel. In order to form meaningful measures from these individual questions, the responses to these 30 questions were factor analyzed, again using the principal component techniques [Nie et al., 1975]. The objectives of this factor analysis were:

1. Identify the true dimensionality of the responses to the 30 questions.
2. If the dimensionality was less than 30, provide a reasonable interpretation to the retained factors.
3. Analyze the stability of AFFDL's OC over time, particularly the manifestation variables associated with each retained factor.
4. Examine the validity and reliability of the obtained

OC factors as reasonable criterion variables for the OD effectiveness research.

OC Dimensionality. A factor analysis of the 1978 data yielded five factors with eigenvalues greater than 1.0, accounting for 56.1 percent of the total variance in the responses to the 30 questions. A similar analysis of the 1979 data yielded six factors with eigenvalues greater than 1.0, accounting for 59.2 percent of the variance. After some analysis, a dimensionality decision to retain five factors was made based on the fact that the sixth factor retained in the analysis of the 1979 data had an eigenvalue only marginally greater than 1.0 (1.07), and retention of only five factors introduced no ambiguities into the factor interpretations.

OC Factor Interpretation. A combined data sample factor analysis was then performed which retained five factors accounting for 55.1 percent of the total variance in Questions 16 through 45. Appendix C contains the factor structure which resulted from a Varimax orthogonal rotation of the five retained factors. Loadings of .4 or greater are underlined for ease of interpretation. Table XI contains a summary of the principal items comprising each factor. The names associated with each factor were suggested by the nature of the questions which "loaded" on each factor, and previous empirical studies of OC (see Appendix B).

As indicated by Table XI, the resulting factor structure is reasonably "clean" in that only a few items exhibited mani-

Table XI

Organizational Climate Factor Analysis Summary
(N=719)*

Factor One Immediate Work Group	Factor Two Employee/Super- visor Interaction	Factor Three Organizational Warmth	Factor Four Organizational Communication	Factor Five Supervisory Support
Q22 (.55) Group Friendly	Q18 (.58) Credit for Work	Q20 (.56) Organ's Loyalty	Q16 (.74) Info-group	Q24 (.63) Sup Hi Stds
Q26 (.61) Group Help	Q19 (.66) Sup Pays Attn	Q23 (.66) Promotion Sys Effective	Q41 (.40) Info Sharing	Q37 (.77) Sup Encourages Best Effort
Q28 (.47) Group Plan	Q21 (.65) Make Decisions w/o Supervisor	Q29 (.43) Rewards greater than Criticism	Q42 (.74) Info-Branch	Q40 (.60) Pressure to Improve
Q31 (.72) Group Pays Attention	Q25 (.45) Supervisor Esteem	Q33 (.48) Organizational Pride	Q45 (.72) Info-Division	Q43 (.60) Supervisor Encourages Ideas
Q32 (.76) Group Exchg Ideas	Q29 (.61) Rewards greater than Criticism	Q34 (.66) Rewards	*Numbers in parantheses are the variable loadings	
Q35 (.72) Group Trust	Q30 (.63) Sup Friendly	Q36 (.67) Decisions	<u>NOTE:</u> Q17 and Q27 do not load at .4 or greater on any factor	
Q38 (.71) Group Sharing	Q39 (.43) Influ Decisions	Q41 (.55) Info Sharing		
Q33 (.52) Organizational Pride	Q43 (.41) Sup Encourg ideas	Q44 (.43) People asked for Ideas		

festation variable complexities greater than one (Questions 29, 33, 41, and 43). Even in those instances a relatively simple interpretation of the involved factors was possible. Only two questions (17 and 27) failed to achieve substantial loadings on at least one factor, and a review of these questions indicates that a reasonable degree of ambiguity is associated with each.

OC Stability. As already indicated, the organizational climate construct has been observed to be relatively stable over time for any particular organization. To check this claim (and investigate the reliability of the OC instrument) a comparison of the 1978 and 1979 OC factor analyses was made. Appendix C contains the separate factor analyses obtained. Based on the high degree of correlation between items comprising each factor, and the similarity in dimensionality noted previously, it was concluded that the reliability of the survey instrument is acceptable.

Factor Validity. Although the validity of the resulting OC factors cannot be conclusively proven, two examinations of scale validity were made: construct validity and intercorrelation among factor items. Construct validity was examined by obtaining the zero-order correlations (Pearson Product Moment Correlations) [Nie et al., 1975] between the five resulting factors (SPSS was used to generate factor scores) and the Hop-pock, Patchen, and productivity factor scores (see page 75). Correlations among factor items were produced by obtaining

zero-order intercorrelations for the various items comprising a particular factor. The results of these analyses are presented in Appendix D. The high intercorrelations among factor items in all five factors (since the logic of the construct calls for high correlations) provides some indication of validity [Cronbach and Meehl, 1955], while the generally weak (but significant) positive correlations between each climate factor and the Hoppock and Patchen measures is also an indication of construct validity. It is interesting to note that the correlations with job satisfaction reveal statistically significant but generally weak results. This result argues against OC (as measured by this instrument in this organization) being redundant with job satisfaction.

OC Factor Summary. Standardized factor scores (mean equals zero, variance equals one) were calculated and retained for each respondent using the FACSCORE capability of SPSS [Nie et al., 1975]. A data check was then made to assure that the factor scores were orthogonal and properly standardized. The five resulting factor scores for each respondent were then added to each case for use as criterion variables in the analysis of AFFDL organizational change.

Productivity Factor Analysis. Questions 51 through 58 of the survey instrument were designed to collect self-reports of the productivity of laboratory scientists and engineers (S&Es). Each S&E was asked to indicate how many of the typical laboratory outputs listed in Table XII he/she authored, pre-

sented, or briefed over the past year.

Table XII
Productivity Categories

<u>Question</u>	<u>Output</u>
51	Published papers in professional or technical journals
52	Technical reports
53	Technical memorandums or test data reports
54	Presentations at symposia, meetings of professional organizations, and technical conferences
55	Hardware/software specifications, statements of work, requests for proposals
56	In-house studies, technical and/or managerial assessments
57	Presentations to general officer-level audiences
58	Professional or technical committee participation (external to the laboratory)

These questions are similar to productivity questions previously used in surveys of AFFDL [Corbin, 1977; Stevens, 1976]. They were developed in conjunction with Mr. Max Davis of AFFDL after a review of laboratory products. All items were assumed to be of equal importance.

Rather than use individual productivity questions in the analysis of organizational change, the responses to these eight questions were factor analyzed using the same methodology that was used for the OC questions. The results of this factor analysis are discussed in the following paragraphs. However,

before the factor analysis was performed, the distributional characteristics of the responses were checked to ensure that the data was reasonable and that no keypunch errors had been made. During this review it was noticed that 16 respondents in the 1978 sample had apparently misinterpreted the instructions for the productivity questions due to the inadvertent inclusion of a percentage sign (%) next to the response blank for these questions. Consequently, these 16 respondents provided output figures to Questions 51-58 which totaled to 100(%). Because of the apparent invalidity of these responses, they were eliminated from the subsequent factor analysis.

Productivity Dimensionality. A principal component factor analysis (PA1) of the productivity responses for the combined sample yielded three factors with eigenvalues greater than 1.0, accounting for 60.1 percent of the variance.

Productivity Factor Interpretation. Table XIII contains the factor structure which resulted from a Varimax orthogonal rotation of the retained factors. As before, loadings of .4 or greater are underlined for ease of interpretation. The names associated with each factor were suggested by the nature of the questions which "loaded" on each factor. Only one item (Question 58) exhibited manifestation variable complexity greater than one, and the reason for the nearly equal loading on factors one and two is probably due to some confusion associated with the phrase "external to the laboratory" in the description of the item.

AD-A076 979

AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCHOO--ETC F/G 5/1
AN ASSESSMENT OF TEAM DEVELOPMENT AT THE AIR FORCE FLIGHT DYNAM--ETC(U)
SEP 79 R 6 DEKOK
AFIT/GSM/SM/79-S-3.

UNCLASSIFIED

NL

2 OF 3
AD-A
076979

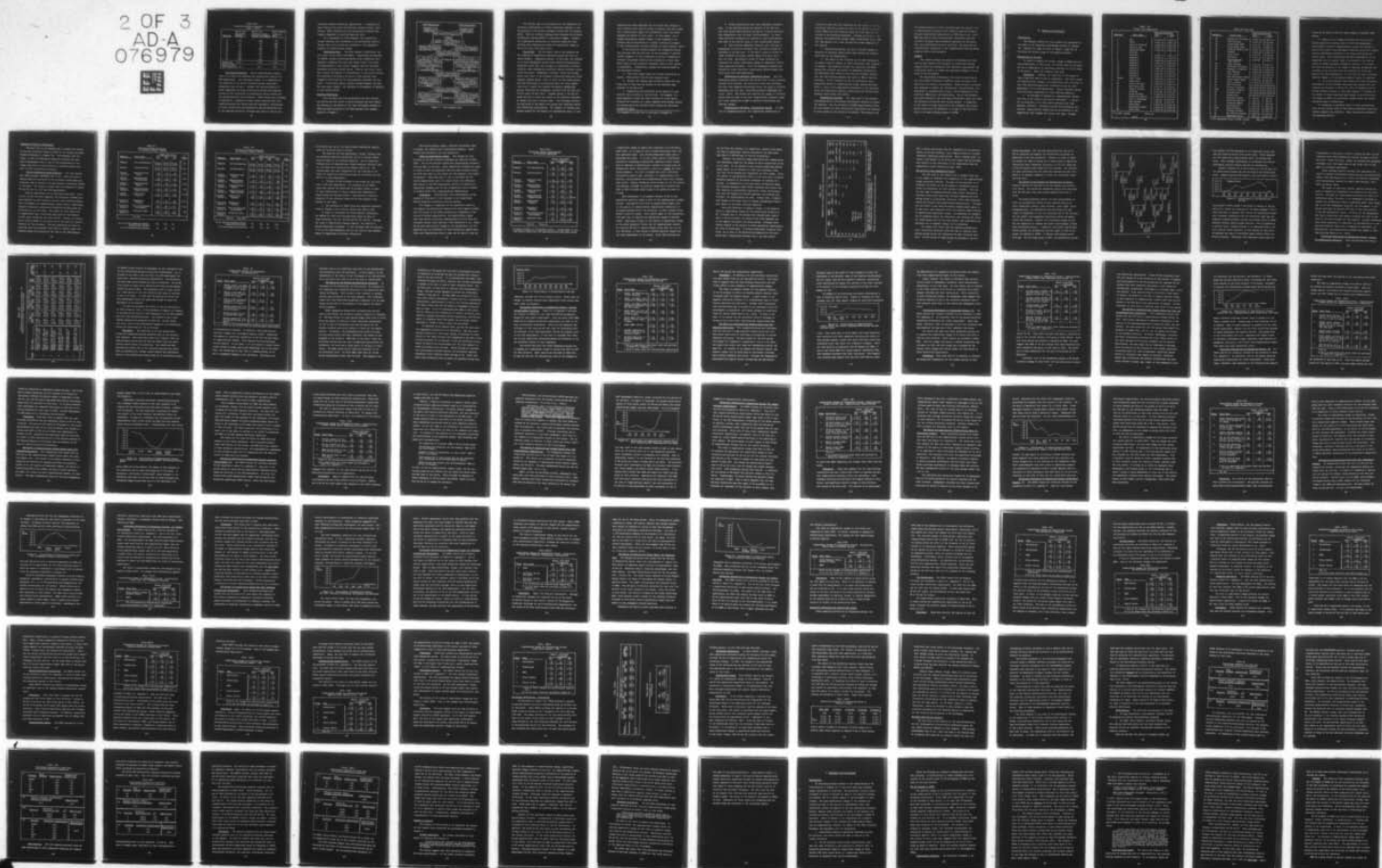


Table XIII
Productivity Factor Analysis - Combined
Data (N=451)

<u>Question</u>	<u>Factor One Management Studies</u>	<u>Factor Two External Profes- sional Development</u>	<u>Factor Three Technical Data</u>
51	-.24	<u>.75</u>	.03
52	.12	.14	<u>.82</u>
53	.04	.03	<u>.85</u>
54	.16	<u>.81</u>	.17
55	<u>.53</u>	.01	.20
56	<u>.76</u>	-.09	.15
57	<u>.75</u>	.04	-.11
58	<u>.52</u>	<u>.51</u>	-.01
Eigenvalue	2.14	1.46	1.20
Percent Vari- ance Explained	26.7	18.3	15.0

Item Intercorrelation. Unlike organizational climate, there is no basis for assuming that productivity levels of an R&D organization are relatively stable, so a comparison of the stability of the factor structure between each year's measurement was not made. Instead, the intercorrelation of items comprising the three productivity factors was examined, as well as the correlation of productivity factor scores with job satisfaction and job motivation. These results are contained in Appendix E. Analysis of these results indicate that item intercorrelations are fairly high and consistent; correlations of factor scores with job satisfaction and job motivation are in the expected direction, although only three of the six cor-

relations reached statistical significance. A comparison of these results with other correlational studies [Corbin, 1977; Patchen, 1965] revealed that the correlations obtained were roughly comparable to previous empirical work.

As a consequence of this analysis, the productivity factors obtained were considered to be sufficiently valid to warrant their use as criterion variables in the subsequent analysis of organizational change.

Absenteeism Data. The final measure, absenteeism, was not a part of the survey instrument. Absenteeism was measured via AFFDL's manhour accounting system which categorizes each employee's absences from work into annual leave, sick leave, an administrative "other leave" category, and (for military personnel) military-related duties. Data on sick leave, which most closely corresponds to "absenteeism" in the private sector, was obtained by dividing a division's total monthly hours charged to sick leave by the total manhours available for the month. A four month period, October through January, was used for each year's sample. The validity of the measure is inherent in the records system.

Research Methodology

Once the data from both measurements had been checked and edited and the eleven criterion measures had been formed, the analysis of the effect of the team development program on AFFDL proceeded according to the data analysis flow diagram depicted in Figure 7.

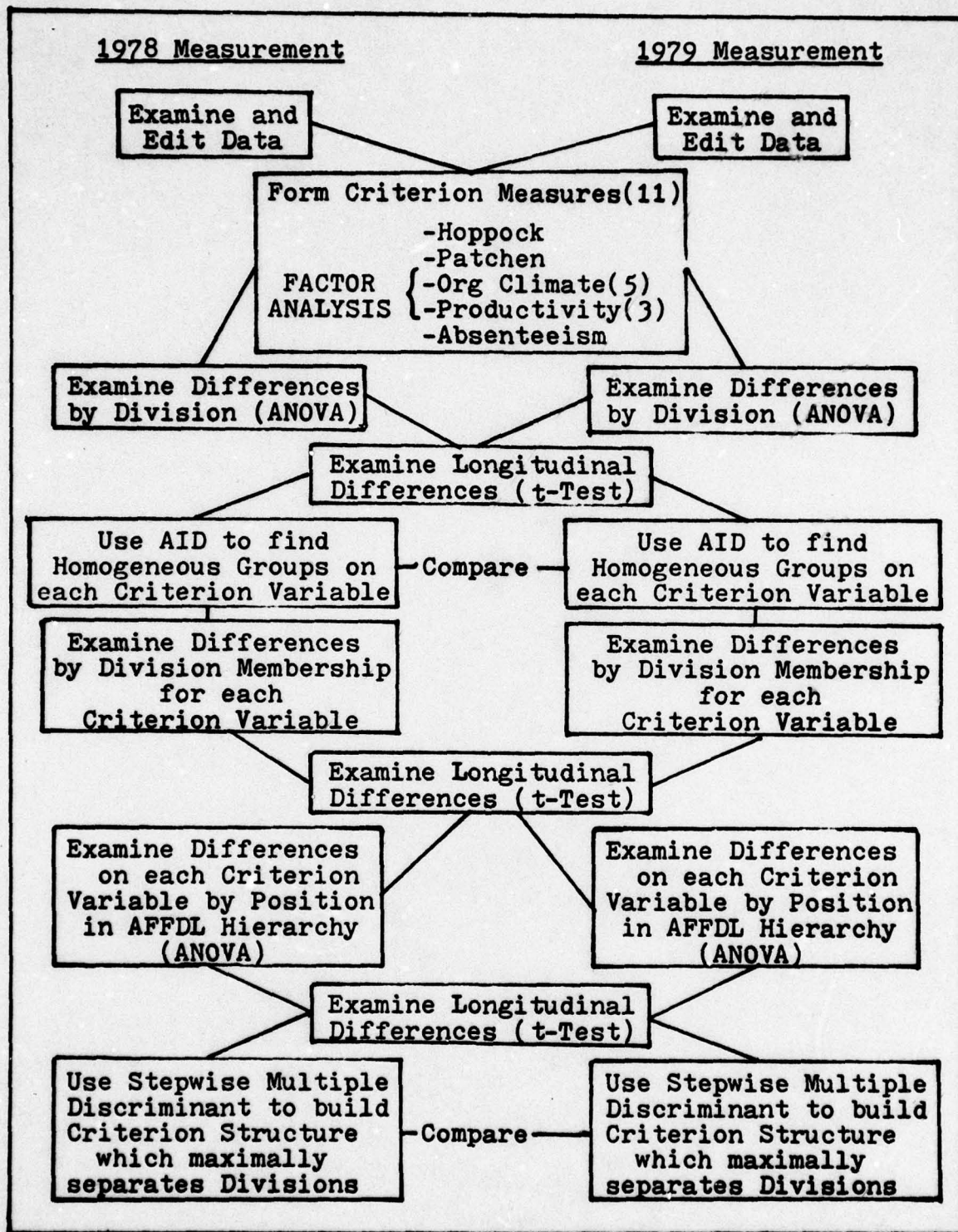


Figure 7. Data Analysis Flow

The initial step in the analysis was the examination of univariate differences in overall laboratory responses to the 58 questions in the survey instrument between the two measurements. Then the criterion measures were examined for division differences (one-way ANOVA) in each year's sample. Finally, the longitudinal differences in criterion scores for each division were computed and tested for significant change at the $p=.05$ level (two-tailed test).

Use of AID. The next major step in the analysis was the creation of homogeneous laboratory groups for each criterion measure. Homogeneous groups, in this case, are defined to be those demographic groups which exhibited statistically different scores than other groups on a particular criterion variable, while possessing relatively similar criterion scores within the group. Demographic variables (items one through seven) were input to the Automatic Interaction Detection (AID) computer program [Gooch, 1972] in order to form these groups. AID then functioned to successively split the total sample (both year's cases) into smaller and smaller homogeneous groups, selecting the demographic variable with the most predictive power at each split. Program values in the AID run cards were set to treat the values of the predictor variables as though they were a nominal scale. This treatment allowed the splitting of the sample into groups that sometimes exhibited interesting relationships. For example, in forming homogeneous groups for the Hoppock job satisfaction score, it was

observed that those employees who had either been assigned to their division less than six months or greater than three years had a statistically higher job satisfaction score than those assigned six months to three years. In this sample, the U-shaped relationship between length of time assigned in the division and job satisfaction is almost certainly an example of the "socialization" process observed by others [Schein, 1971].

In selecting for further analysis the homogeneous groups that resulted from the AID runs, it was necessary to exercise careful judgment. In this researcher's opinion, attempting to interpret the groups formed by the interaction of more than about three or four predictor variables (three to four splits) is problematic. Consequently, groups were selected based on the following criteria:

1. Group size large enough for further statistical analysis. Sizes greater than 30 were normally used.

2. Groups with similar mean criterion scores were combined even if they were the product of two different main branches of the AID tree*.

3. Homogeneity was determined by the splits (or lack thereof) which occurred in the AID tree. For example, if a group appeared to meet the other criteria but later splits revealed the inclusion of a small subgroup with extreme scores, the extreme group was excluded before defining the particular homogeneous group.

* An example of an AID tree is provided in Chapter IV

4. Groups selected must have been reasonably interpretable. It was observed during the analysis of the AID runs that some groups resulting from AID splits, although statistically homogeneous, were virtually uninterpretable. In these cases predictor variables were removed or other modifications were made to the AID run cards to find interpretable groups.

5. Both division membership (Question six) and year of measurement (a zero-one variable) were included as predictor variables in all AID runs. If AID split a group on either of these variables the groups created beyond this split point were not used. Splitting on either of these variables was indicative of either longitudinal change or significant differences among the divisions. Since the subsequent analysis was directed at these objectives, using groups defined beyond this point would have been meaningless.

Differences by Division: Homogeneous Groups. Once the homogeneous groups resulting from the AID runs on each criterion variable were selected, two statistical tests were performed. The first test examined differences within the group by division membership for each year, using SPSS procedure BREAKDOWN [Nie et al., 1975]. The second test involved the change in criterion scores from one year to the next (longitudinal analysis) using the t-test capability of SPSS to identify statistically significant changes.

Differences by Division: Hierarchical Groups. In addition to homogeneous groups, the longitudinal differences on

criterion scores that were exhibited for the various hierarchical groups (defined by Question seven in the survey instrument) within AFFDL were also examined using the tests that were described in the preceding paragraph. Although by no means homogeneous, the hierarchical groups (S&Es, Technicians, Group Leaders, Secretaries, etc.) were selected for further analysis for two reasons:

1. Hierarchical groups have more intuitive appeal as subjects for analysis, particularly when results are communicated back to the organization.

2. The effect of the intensity of the team building intervention could be tested, at least indirectly, with hierarchical groups. Conversations between the researcher and AFFDL members had revealed that people in management positions in the laboratory were likely to have had more frequent contact with the team building program than those in S&E or clerical positions. If the intensity of the OD intervention had a significant effect on organizational change [Porras and Berg, 1978], a test of the longitudinal differences on the criterion scores by hierarchical position (controlling for division membership) would reveal this effect.

Discriminant Analysis. The final step in the research methodology was to use multiple discriminant analysis to answer the question: are the divisions of AFFDL significantly different with respect to their multivariate descriptions as revealed by their scores on the criterion variables? This question and

the related question of which variables play the largest role in separating the divisions were answered using the stepwise multiple discriminant capabilities of SPSS [Nie et al., 1975]. SPSS was used to build a discriminant function(s) from the criterion variables which maximally separates the divisions. Once this discriminant function was built, its power and the classificatory capability of the classification function which resulted from it were analyzed.

Summary

The research design and analysis methodology that were used in this research were designed to reveal goal-related changes within the laboratory with sufficient experimental and statistical control to enable any discovered changes to be related to the OD program.

The longitudinal differences that would be exhibited by the main product divisions of AFFDL on eleven criterion variables were the focus of the analysis. These criterion variables were designed to measure job satisfaction, job motivation, five dimensions of organizational climate, three dimensions of productivity (S&Es only), and absenteeism. Two of the divisions were participating in the OD program (FE and FG), while the other two divisions (FX and FB) were control groups. A comparison of the rates of change exhibited by the treatment and control groups would allow an assessment to be made of the effectiveness of the team building program in AFFDL.

IV Results and Discussion

Introduction

The analysis results for this research are presented in the order of the sequential methodology outlined in Chapter III. Readers are urged to refer to Figure 7 (page 79) in following the various steps in the analytic process.

Examination of the Data

In order to compare the overall change in AFFDL from the first measurement to the second, the initial step in the analysis was an examination of laboratory responses to the 58 items in the survey. Table XIV contains these data.

Discussion. Overall, the stability in the scores of these items from 1978 to 1979 is remarkable. Only three items: one organizational climate, one productivity, and one nature of work item exhibited significant differences from the 1978 measurement to the 1979 measurement. Several possible reasons could have been responsible for this observed stability:

1. As discussed in Appendix B, organizational climate (the bulk of the items in the survey instrument) "...has an air of permanency or at least some continuity over time" [Woodman, 1978:818]. Although elicited from individual perceptions, organizational climate may be an attribute of the organization that changes very slowly over time. Perhaps

Table XIV
Survey Item Comparison*

Question	Short Name	Mean/Std Deviation	
		1978	1979
1	Age	4.46/2.10	4.35/2.16
2	Grade	3.82/1.51	3.74/1.55
3	Years in Division	5.39/2.00	5.53/1.86
4	Years in Lab	3.40/1.72	3.36/1.72
5	Education Level	4.78/1.81	4.79/1.67
6	Division	a	a
7	Position	3.04/1.19	2.93/1.14
8	Hoppock-1	4.71/1.37	4.87/1.23
9	Hoppock-2	4.88/1.04	4.94/1.00
10	Hoppock-3	4.66/1.07	4.69/1.05
11	Hoppock-4	4.51/.94	4.51/.90
12	Patchen-1	3.94/1.28	3.96/1.18
13	Patchen-2	3.23/.82	3.22/.76
14	Patchen-3	3.36/1.31	3.41/1.24
15	Patchen-4	3.69/.85	3.72/.82
16****	Info: Group	3.03/1.29	3.27/1.29
17	Objectives	3.81/.89	3.86/.81
18	Credit for Work	3.36/1.24	3.53/1.23
19	Supv Pays Attn	3.71/.95	3.73/.95
20	Organ'l Loyalty	3.13/1.17	3.09/1.15
21	Autonomy	4.14/.99	4.13/1.02
22	Group Friendly	4.19/1.02	4.17/.94
23	Promot Sys Effectv	2.28/1.14	2.32/1.14
24	Supv Hi Standards	3.59/.95	3.68/.94
25	Supv Esteem	3.20/.97	3.31/.87
26	Group Help	2.87/1.08	2.76/1.02
27	Know What's Exptd	3.78/1.04	3.80/1.00
28	Group Plan	3.10/1.08	3.11/1.04
* n ₁ =364 n ₂ =412		****p=.02	
a=N/A			

Table XIV (Cont'd)#

Question	Short Name	Mean/Std Deviation	
		1978	1979
29	Rewards GT Criticism	3.24/1.26	3.34/1.24
30	Supv Friendly	4.14/1.12	4.19/.99
31	Groups Pays ATTN	3.71/.77	3.66/.74
32	Group Exchg Ideas	3.53/.87	3.54/.82
33	Organizational Pride	3.66/1.03	3.60/1.03
34	Rewards	2.74/1.14	2.76/1.12
35	Group Trust	3.75/.91	3.65/.89
36	Decisions	2.65/1.11	2.65/1.09
37	Supv Encourage Best Effort	3.49/.98	3.54/.92
38	Group Sharing	3.70/.92	3.69/.83
39	Influence Decisions	3.30/1.25	3.37/1.20
40	Pressure to Improve	2.88/1.05	3.00/1.04
41	Info Sharing	2.46/1.04	2.56/1.05
42	Info: Branch	3.17/1.18	3.27/1.13
43	Supv Encourages Ideas	3.31/.99	3.37/.95
44	People asked Ideas	2.82/1.09	2.91/.99
45	Info: Division	2.68/1.21	2.82/1.13
46	R&D (In-house)	27.15/26.56	26.85/25.32
47	Contract Guidance	18.50/20.74	20.25/20.37
48**	Technical Support	20.57/21.99	16.33/18.31
49	Program Admin	23.55/20.05	25.59/20.66
50	Supervision	9.03/14.79	9.75/17.06
51	Published Papers	.34/.72	.34/.75
52	Technical Reports	.56/1.27	.37/.71
53	Technical Memos	.94/1.95	.74/1.46
54	Presentations	.91/1.49	.79/1.26
55**	Specifications	2.55/3.73	1.84/2.88
56	In-House Studies	2.06/3.61	1.57/3.21
57	Gen Officer Present.	1.38/2.84	1.19/2.23
58	Committee Partic	.89/1.77	.87/1.40

For Questions 46-58, $n_1=206$; $n_2=245$

**p=.05

a year is too short a time for these changes to manifest themselves.

2. Almost all the change resulting from the OD intervention might have occurred prior to the first measurement. Using Likert's model of organizational change (see Chapter I), most of the items in the instrument (Questions 16-45) are classified as intervening variables in the causal-intervening-end result chain. Since intervening variables (perceptions of the employees) are the closest class of variables in the time sequence to causal variables, managerial behavior, it is possible that the majority of the change in employee perceptions had occurred in the two years from the inception of the OD program to the first measurement. If this was the case, continued positive change in the perceptual measures cannot be expected.

3. It is also possible that between the first and second measurements the OD treatment had positively affected the perceptions of personnel in FE and FG, while the members of FX or FB had suffered declines on these same measures. Although the net effect of these happenings might appear to be little overall change in AFFDL, the perceptual changes within the various divisions might be substantial.

In attempting to determine which of these alternatives were the most likely cause of the observed laboratory stability, further analysis was conducted. These results are provided in the following section.

Analysis of Division Differences

The next step in the analysis was to examine the scores of the four divisions (three in 1978) on the various criterion measures developed in Chapter III. This analysis took two forms: a test of differences among the divisions for each year's measurement; and, a test of the significance of the change exhibited for each division on criterion scores from 1978 to 1979 (longitudinal analysis).

Test of Differences Among Divisions. For each measurement SPSS procedure BREAKDOWN [Nie et al., 1975] was used to examine means and variances of the criterion scores among the divisions, and to perform a one-way analysis of variance (ANOVA) on the data. The results of these tests are depicted in Tables XV and XVI for the 1978 and 1979 measurements.

Several observations can be made from these data. First of all, as the 1978 data suggests, the divisions of AFFDL were quite similar in their scores on all but one criterion measure. That one measure (an organizational climate factor, Supervisory Support) indicated a significant difference existed among the divisions at a $p=.002$ level. The reason for this high level of significance was a relatively high score on this measure for FE, and a relatively low score for FB. However, no conclusions could be drawn at this point due to the lack of a pre-OD baseline for the divisions. The main importance of these results was that they revealed there were no overall, major differences among the divisions at the time of the 1978 measure-

Table XV
Differences Among Divisions
on Criterion Scores (1978)#

Measure	Short Name	Means and (S.D.)			F Value
		FX	FB	FE	
Hoppock	Job Satisfaction	18.62 (3.86)	19.09 (3.45)	18.55 (3.90)	.77
Patchen	Job Motivation	14.22 (3.01)	13.90 (3.41)	14.62 (3.33)	1.41
Climate Factor 1	Immediate Work Group	.12 (.91)	.05 (1.11)	.10 (1.02)	.16
Climate Factor 2	Employee/Supv Interaction	.04 (1.06)	-.02 (1.08)	.00 (.92)	.08
Climate Factor 3	Organizational Warmth	-.18 (1.02)	.09 (1.00)	-.05 (1.06)	2.09
Climate Factor 4	Organizational Communication	-.17 (.94)	-.02 (1.01)	-.11 (1.03)	.63
Climate Factor 5	Supervisory Support	.00 (1.03)	-.25 (1.02)	.25 (.95)	6.55*
Productvty Factor 1	Management Studies	.00 (.93)	-.01 (1.02)	.34 (1.33)	2.02
Productvty Factor 2	Ext Professional Development	-.20 (.76)	.07 (1.21)	.16 (1.11)	1.99
Productvty Factor 3	Technical Data	-.07 (.63)	.20 (1.75)	.14 (.86)	.89
*p=.002					

n's for all measures except
Productivity Factors
n's for Productivity Factors

105	137	92
65	86	54

Table XVI
Differences Among Divisions
on Criterion Scores (1979)#

Measure	Short Name	Means and (S.D.)				F Value
		FX	FB	FE	FG	
Hoppock	Job Satisfaction	18.98 (3.23)	19.06 (3.60)	18.99 (3.62)	19.06 (3.57)	.01
Patchen	Job Motivation	14.06 (3.01)	14.26 (3.13)	14.76 (2.99)	14.16 (3.05)	.78
Climate Factor 1	Immediate Work Group	-.20 (1.05)	-.02 (.99)	.04 (.94)	-.07 (.94)	.76
Climate Factor 2	Employee/Supv Interaction	.06 (1.07)	.00 (1.00)	-.11 (1.01)	.08 (.86)	1.18
Climate Factor 3	Organizational Warmth	-.26 (1.01)	.17 (.90)	-.06 (1.05)	.11 (.94)	2.97*
Climate Factor 4	Organizational Communication	-.17 (1.02)	.08 (.86)	.32 (1.07)	.11 (1.04)	2.81*
Climate Factor 5	Supervisory Support	.04 (.99)	-.12 (1.04)	.15 (1.01)	.04 (.90)	1.15
Productvty Factor 1	Management Studies	-.16 (.71)	-.12 (1.26)	.11 (.81)	-.07 (.82)	.72
Productvty Factor 2	Ext Professional Development	-.02 (.85)	.26 (1.31)	-.07 (.72)	-.17 (.77)	1.76
Productvty Factor 3	Technical Data	-.06 (.51)	.22 (1.08)	-.08 (.56)	-.36 (.39)	6.12**
*p=.03 **p=.0001						

# n's for all measures except Productivity Factors	98	105	81	112
n's for Productivity Factors	64	58	49	72

ment since only one of ten tests reached statistical significance at the $p=.05$ level or better.

The data for the 1979 measurement, though, revealed that the divisions exhibited significant ($p=.03$ or better) differences on three of ten criterion measures. Two of these differences were on organizational climate measures (factors 3 and 4); the other was a productivity measure (factor 3). Two reasons might have been responsible for the tripling of the number of significant differences among the divisions from the 1978 to the 1979 measurement.

1. Division FG was included in the survey for the first time in the 1979 measurement. Its inclusion in the ANOVA could have induced the grand mean of division scores to raise or lower sufficiently to cause a significant difference to appear among the division scores. This would be a valid explanation if the criterion scores for FG were biased in one extreme or the other.

2. The divisions of AFFDL could have exhibited different rates of change on the criterion scores from 1978 to 1979.

In order to investigate the first possible explanation, the ANOVAs for 1979 were reaccomplished using two sets of three divisions: FX, FB, and FE; and FX, FB, and FG. Although the level of significance changed slightly, the results remained essentially unchanged. It was concluded that the addition of FG in the 1979 measurement was not the cause of the expanded number of significant divisional differences.

The second possible reason, different divisional rates of change, was examined with longitudinal analysis. These results are provided in the next subsection.

Tests of Longitudinal Change. The changes for each division on the ten criterion variables are depicted in Table XVIII. Two of the division scores were significantly different from one year to the next. These results were revealed by using a t-test to test the hypothesis that the mean criterion scores for 1978 were equal to the scores for 1979 against a two-tailed alternative. From these data it can be concluded that FX scored significantly lower on climate factor one (Immediate Work Group) in the 1979 measurement; FB did not exhibit any significant changes; and, FE had a significant rise in scores on climate factor four (Organizational Communication)

Discussion. Unfortunately, the interpretation of the results at this point in the analysis is not unequivocal. Several possible conclusions could be reached.

For example, a comparison of the laboratory scores on the Hoppock job satisfaction measure with other samples reveals that the scores of all AFFDL divisions are comparable to the scores of similar organizations, and significantly higher than some scores of military organizations for which data are available [Trask, 1973; Westover, 1975; McNichols et al., 1978]. FE did show some positive change in job satisfaction, but the magnitude was not sufficient to reach statistical significance. This could indicate that either a year was too short a time for

Table XVII
Divisional Change (Longitudinal)
on Criterion Measures#

Measure	Short Name	Means: 1979-1978 (t-value)		
		FX	FB	FE
Hoppock	Job Satisfaction	.36 (.73)	-.03 (-.07)	.44 (.79)
Patchen	Job Motivation	-.16 (-.38)	.36 (.86)	.14 (.29)
Climate Factor 1	Immediate Work Group	-.32 (-2.24)**	-.07 (-.48)	-.06 (-.37)
Climate Factor 2	Employee/Supv Interaction	.02 (.14)	.02 (.16)	-.11 (-.70)
Climate Factor 3	Organizational Warmth	-.08 (-.53)	.08 (.63)	.00 (-.02)
Climate Factor 4	Organizational Communication	.00 (-.03)	.10 (.81)	.42 (2.59)***
Climate Factor 5	Supervisory Support	.04 (.25)	.13 (.93)	-.10 (-.65)
Productiv Factor 1	Management Studies	-.16 (-1.11)	-.12 (-.57)	-.23 (-1.06)
Productiv Factor 2	Ext Professional Development	.19 (1.32)	.18 (.87)	-.23 (-1.26)
Productiv Factor 3	Technical Data	.01 (.12)	.03 (.11)	-.23 (-1.60)
		p=.03 *p=.01		

numbers rounded to two decimal places; values shown in this and similar tables are 1979 mean scores minus 1978 mean scores

a significant change to appear (but indicative of an OD-associated trend), or it might be just a random fluctuation about the true population mean. Only another measurement might help in resolving this issue. It is also likely that an intervention directed at increasing interpersonal competence cannot reasonably be expected to significantly increase an already high job satisfaction score, particularly a score on a global job satisfaction measure. It could be argued that only a structural intervention aimed at pay, promotion, or organizational work, policies, and procedures could significantly affect such already high scores. Similar statements could be made for the job motivation measure, although the positive change that occurred from 1978 to 1979 is hardly large enough to be called the start of a trend.

More perplexing is the apparent failure of FE to show significant positive change on more of the organizational climate factors. Although FE did achieve a significantly higher score on the quality of organizational communication (indicative of increased openness within the division), no other climate factor showed a positive change. Such results argue for the proposition that more time is required for significant change to manifest itself. Especially notable is the absence of significant change on the group dimension (factor one) of organizational climate. Not only did FE fail to achieve higher scores than the two control divisions, it also failed to exhibit positive change from the first measurement to the second. Since team building has

as its focus the creation of a supportive, cohesive work group, the lack of significant results indicated by the data casts some doubt on the efficacy of this OD intervention.

However, the positive change associated with communication and information needs for the people in FE is significant at the $p=.01$ level. In the absence of any evidence supporting another causal agent, it is difficult to reach any conclusion other than that the OD program was responsible for this change. Still, the absence of any measurable effect on the nine other criterion variables measured by the survey instrument is somewhat perplexing. An examination of the zero-order correlations among the criterion measures (Table XVIII) indicates that factor four (F_4) exhibits a statistically significant linear relationship with only the Hoppock and Patchen measures, and although significant, the relationships are weak. Clearly then, a significant change in F_4 scores could be readily accomplished without much effect on the other criterion measures.

Even more difficult to explain, though, is the negative trend in longitudinal change for the productivity measures in FE. Although none of the changes were statistically significant at the $p=.05$ level, the trend on all three measures was in the negative direction and fairly strong. Although inconclusive because of the failure to reach statistical significance, the trend is disturbing. If another measurement sustained this trend, one or more of the productivity measures for FE would likely show a significant decrease over a two year period.

Table XVIII
Combined Year Criterion Variable Intercorrelations^b

	HOPP	PATCH	F1	F2	F3	F4	F5	P1	P2	P3
HOPP	1.0	.50****	.28****	.37****	.23****	.20****	.10****	.03	.09*	.04
PATCH		1.0	.09**	.14****	-.02	.21****	.03	.17****	.27****	.01
aP1			1.0	--	--	--	--	.15****	-.14****	-.10*
F2				1.0	--	--	--	-.03	.02	-.05
F3					1.0	--	--	-.05	-.03	-.05
F4						1.0	--	.07	.04	.03
F5							1.0	-.03	-.05	.00
aP1								1.0	--	--
P2									1.0	--
P3										1.0

***p=.001
**p=.003
*p=.01
*p=.03

^aBecause the Climate (F1 - F5) and Productivity (P1 - P3) measures are factors rather than scale scores, they are orthogonal, i.e., the factors comprising these two measures have zero intercorrelations

^bN=719 except for the Productivity Factors where N=446

Such a result would argue that OD, regardless of its positive effect on process variables, has a negative effect on outcome variables--especially productivity. Such a finding would, of course, lend support to OD critics who assert that OD provides more benefit to the individual in the organization than the organization itself [Porras and Berg, 1978].

Use of AID to Find Homogeneous Groups

The next step in the analysis was to examine subgroups of the sample to determine the homogeneity of the organizational change previously observed. The goal of this analysis is to determine the effect of the OD program on homogeneous groups within the laboratory for each criterion variable. The need for this type of analysis warrants some further discussion. A situation could arise where some division subgroups may have rising scores on a particular criterion, while other subgroups within the division were experiencing falling scores. Although the net effect of all these divisional changes might appear to be near zero, some subgroups within the division might actually be experiencing significant change. By examining the homogeneity of subgroups within the laboratory, and checking the scores for these groups over the two year period, this alternative explanation for no apparent change can be eliminated.

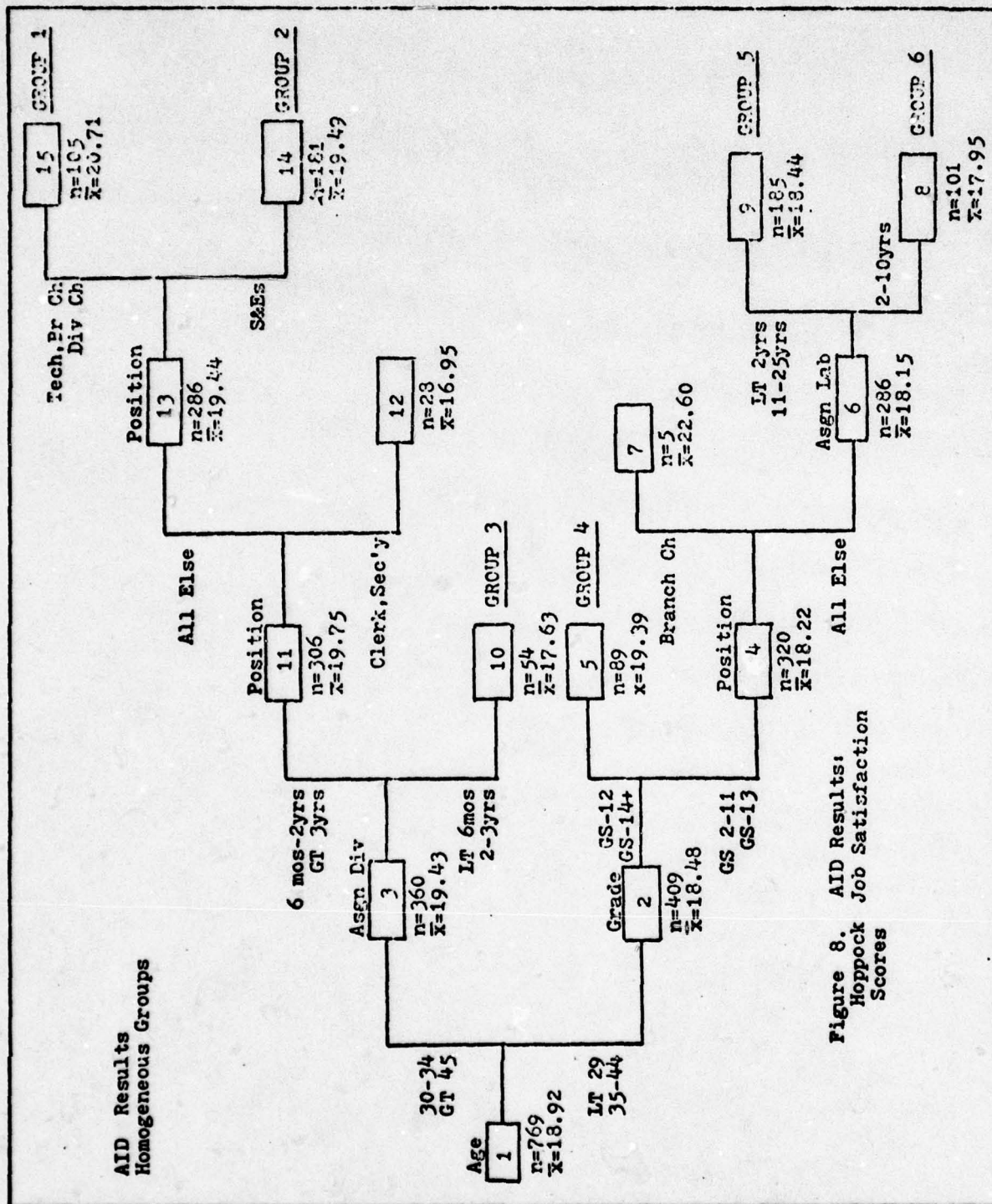
The reader will recall that the analysis program Automatic Interaction Detection (AID) was used to identify homogeneous groups within the laboratory for each criterion variable. A brief review of these groups is provided in the fol-

lowing paragraphs. All the data associated with the use of AID in analyzing the Hoppock job satisfaction criterion are presented in the next subsection. However, in order to spare the reader the task of coping with a large array of repetitious statistical data, subsequent discussion of the nine remaining criterion measures only summarizes the findings. The statistical data associated with the remaining analyses has been relegated to an appendix (Appendix F) where the interested reader can scan them.

AID Splits on the Hoppock Job Satisfaction Criterion.

Figure 8 depicts the AID splits for the Hoppock job satisfaction scores. Six relatively homogeneous groups were developed from the AID data, with mean scores ranging from 17.63 to 20.71.

The groups generally exhibit the same relationships in their job satisfaction scores as that reported earlier by other researchers [Corbin, 1977; Westover, 1975; Trask, 1973]. Demographically, job satisfaction was associated with age, length of assignment to both the laboratory and to the division, and the higher level management positions (status and grade) within the division. However, the interactive design of AID and its capability to display non-linear relationships yielded some interesting results. A definite curvilinear relationship exists between job satisfaction and the length of time an employee is assigned to AFFDL. A similar relationship exists with age. For one large group (n=286), job satisfaction scores



were highest for those assigned to the laboratory either less than two years or greater than eleven years. Those assigned for 2-10 years had a significantly lower job satisfaction score. This U-shaped relationship is contrasted with the relationships observed between age and job satisfaction.

Figure 9 depicts the trends revealed in the AID data for the relationship between age and the Hoppock job satisfaction score. Readers familiar with Schein's work will notice a striking

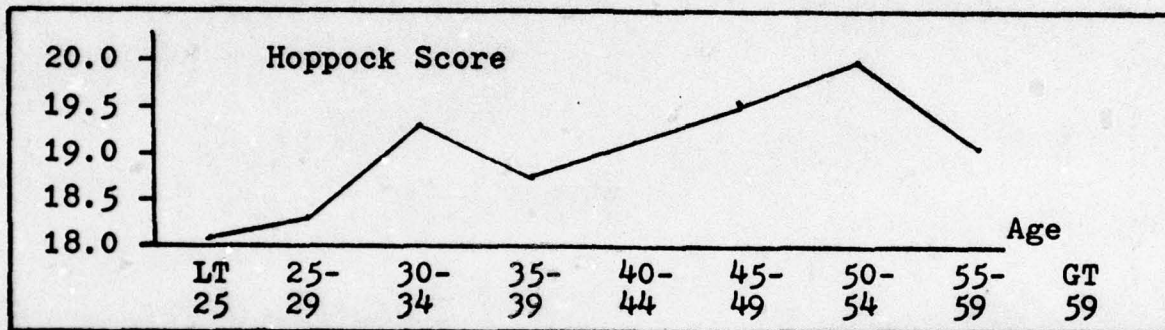


Figure 9. Relationship of Job Satisfaction and Age

ing parallel between Figure 9 and Schein's concept of the dynamics of a career as a sequence of "boundary passages" [1971]. From these data it appears that initial job satisfaction gradually increases (presumably with the relatively rapid pay and promotion rewards prevalent during this period) until an AFFDL employee reaches his/her middle thirties. This is apparently a critical point, perhaps because it is associated with a crucial "stay-or-leave" decision, or even because at this point an employee can begin to accurately gauge his/her future promotion potential. Obviously, most employees suffer some dis-

illusionment at this point, however, because the mean job satisfaction score falls dramatically between the ages of 30-34 and 35-39. After this fall, though, job satisfaction gradually increases to an even higher peak at age 55-59, only to fall again as retirement approaches.

These findings conflict somewhat with researchers who report a U-shaped relationship between age and job satisfaction [Ronen, 1978; Hertzberg et al., 1957], but they are consistent with relationships observed by others [Hunt and Saul, 1975; Hulin and Smith, 1965].

The reader is cautioned, however, against placing too great an emphasis on demographics as predictors of job satisfaction. Although the relationships discussed are valid in a statistical sense, the power of the demographic variables to predict job satisfaction scores is generally weak. Even though age is the best demographic predictor for this sample, it explains less than two percent ($R^2=.017$) of the total variance in the job satisfaction scores. In fact, all the demographics and their interactions only explain slightly more than 19 percent of the total variance for this measure. As many researchers have noted, prediction of individual job satisfaction is a complex and difficult task which is hampered by individual, organizational, and interactional variables that appear to defy easy modeling [Smith et al., 1964].

Divisional Differences by Homogeneous Groups: Hoppock Job Satisfaction Criterion. Table XIX provides the results

Table XIX

Differences Among Divisions on Hoppock Job
Satisfaction Scores: Homogeneous Groups

Group	Short Name	Mean and (Std Dev)										F-Value	
		FX		FB		FE		FG		1978	1979		
		1978	1979	1978	1979	1978	1979	1978	1979	1978	1979		
1	Mostly Older, Non-S&Es, assigned to Div 6 mos-2 years or GT 3 years	20.29 (2.24) n=21	19.89 (3.18) n=19	19.56 (4.59) n=18	20.70 (3.70) n=20	20.79 (2.37) n=19	20.76 (1.45) n=21	20.83 (1.60) n=16		.70	.32		
2	Mostly Older S&Es assigned to Div 6 Mos-2 years or GT 3 years	20.00 (3.37) n=16	19.73 (2.88) n=22	20.21 (2.57) n=33	19.04 (3.39) n=27	18.82 (3.11) n=17	19.80 (2.98) n=15	18.95 (3.32) n=21		1.32	.40		
3	Mostly Older Employees assigned to Div LT 6 months or 2-3 years	17.11 (6.19) n=9	19.50 (3.42) n=4	19.15 (2.82) n=13	14.00 (7.55) n=3	18.29 (4.61) n=7	18.29 (2.87) n=7	15.89 (5.11) n=9		.54	.87		
4	Mostly Younger GS 2-11 and GS 13s in lab LT 2 or 11-25 years	16.76 (3.79) n=25	17.78 (2.81) n=23	18.92 (3.03) n=38	19.83 (1.88) n=24	17.17 (4.39) n=24	17.90 (3.77) n=20	19.57 (2.56) n=30		2.21	3.59*		
5	Mostly Younger GS-12s or GS-14s and above	19.80 (3.26) n=15	19.47 (3.31) n=15	19.47 (2.64) n=15	19.18 (3.19) n=11	18.10 (4.04) n=10	17.50 (4.18) n=6	20.47 (3.14) n=17		.87	1.23		
6	Mostly Younger GS 2-11 and GS-13s in Lab 2-10 years	18.07 (4.36) n=14	17.44 (5.13) n=9	17.07 (4.70) n=15	17.00 (3.95) n=12	18.64 (4.05) n=14	13.30 (5.79) n=10	18.36 (4.27) n=25		.40	.26		
*p=.02													

of ANOVAs (using division of assignment as the "treatment") for the six AID-defined groups in each year's measurement. As indicated by the table, only one test, the 1979 measurement for group four, reached statistical significance. The difference for this test occurs between two sets of divisions: FX and FE with a score of about 17.8, and FB and FG which scored approximately one point higher. The hypothesis that the mean scores for these groups in all four divisions are equal is rejected at the $p=.02$ level. In this case the addition of FG for the 1979 measurement raised the grand mean enough to cause the hypothesis to be rejected.

In order to ascertain the effect of the OD intervention on this criterion, then, it was necessary to examine the changes in the mean scores from the 1978 measurement to the 1979 measurement for each AID-defined group. The results of this longitudinal analysis are presented in Table XX. As the reader will note, none of the longitudinal changes in job satisfaction scores are significant at the $p=.05$ level.

Discussion. The stability of the job satisfaction scores for homogeneous groups parallels that of the division-wide analysis. From these data there is no evidence that the team building intervention has had any effect upon job satisfaction scores within the laboratory. The relatively weak associations between all of the criterion measures and individual job satisfaction, though, argues against any substantial effect on job satisfaction being caused by an intervention aimed

Table XX
Longitudinal Change for Homogeneous
Groups: Job Satisfaction

Group	Short Name	Means: 1979-1978 (t-value)*		
		FX	FB	FE
1	Mostly older, non-S&Es, assigned to Div 6 mos-2 years or GT 3 years	-.40 (-.46)	1.14 (.84)	-.03 (-.05)
2	Mostly older S&Es assigned to Div 6 mos-2 yrs or GT 3 years	-.27 (-.26)	-1.17 (-1.48)	.98 (.91)
3	Mostly older employees assigned to Div LT 6 months or 2-3 years	2.39 (.89)	-5.15 (-1.16)	0 (0)
4	Mostly younger GS 2-11 ans GS-13s in Lab LT 2 or 11-25 years	1.02 (1.06)	.91 (1.46)	.73 (.59)
5	Mostly younger GS-12s or GS-14s and above	-.33 (-.28)	-.29 (-.25)	-.60 (-.28)
6	Mostly younger GS 2-11 and GS-13s in Lab 2-10 years	-.63 (-.37)	-.07 (-.04)	-.34 (-.16)
*None of the differences are statistically significant				

at interpersonal processes. In addition, these data may provide some insight into the Hoppock measure itself. Apparently the measure is relatively insensitive to all but the most major of organizational changes. Such insensitivity has both good and bad aspects. On one hand, it is not subject to rapid fluctuations caused by normal day-to-day happenings; but on the other hand, its inertia may be such that it responds slowly (if at all) to permanent changes in the laboratory. This may be es-

pecially true at the relatively high level of job satisfaction that prevails within the laboratory. In this respect, if the measurement of the effect of the OD program on job satisfaction errs, any error will tend to be on the side of conservatism.

AID Splits on the Patchen Job Motivation Criterion. As discussed in the introduction to this section, the analysis of the remaining nine variables omits most of the associated data tables and figures. This is done in the interest of helping provide some continuity to the data analysis. The interested reader will find these data presented in Appendix F in the same format as was used in the analysis of the Hoppock job satisfaction measure.

Eight homogeneous groups were developed from the AID runs on the Patchen job motivation measure (Figure F-1, Appendix F). The mean scores for these groups ranged from 12.04 to 16.03. Given the amount of overlap in their zero-order correlations ($r=.50$) it was not surprising that the AID splits for the Patchen criterion were quite similar to those for the Hoppock measure. In general, the demographics associated with high job motivation scores were age, education, and length of time assigned to the division. S&Es had, on the whole, lower job motivation scores than any other occupational group within the laboratory, but there was a large amount of variance in their scores. For S&Es, grade was an important moderator of the job motivation score. Of those S&Es older than 30, GS-13s scored significantly lower than GS 8-12s. This apparent con-

tradition of the grade-job motivation relationship can best be explained by recalling the age-job satisfaction relationship of the last section. It is hypothesized that S&Es, upon reaching the grade of GS-13, discover that further advancement in grade is not open to them in their technical field. For the most part, if they wish to continue their advancement in grade, they must become managers no matter how technically competent they may be. For many S&Es the prospect of 20 or more years without advancement in grade must be a considerable disincentive, particularly in view of the limited opportunity for them to move into the few number of management positions open to them. It is not surprising that S&Es at this point, held in their job by a combination of status, relatively good benefits, perhaps diminished outside opportunity, and the prospect of a generous early retirement (the so-called "golden handcuffs"), suffer a drop in their job motivation.

As observed in the Hoppock data, age was the most powerful demographic predictor of job motivation. Age was a more powerful predictor in this case, though, accounting for seven percent of the total variance (all demographics and their interactions accounted for 23 percent) in the job motivation scores. Figure 10 depicts the relationship (for the total sample) between the Patchen score and age. Unlike the age-job satisfaction relationship reviewed earlier, job motivation exhibits remarkably little variation after the age of 30. After this point other predictors such as grade and education become more

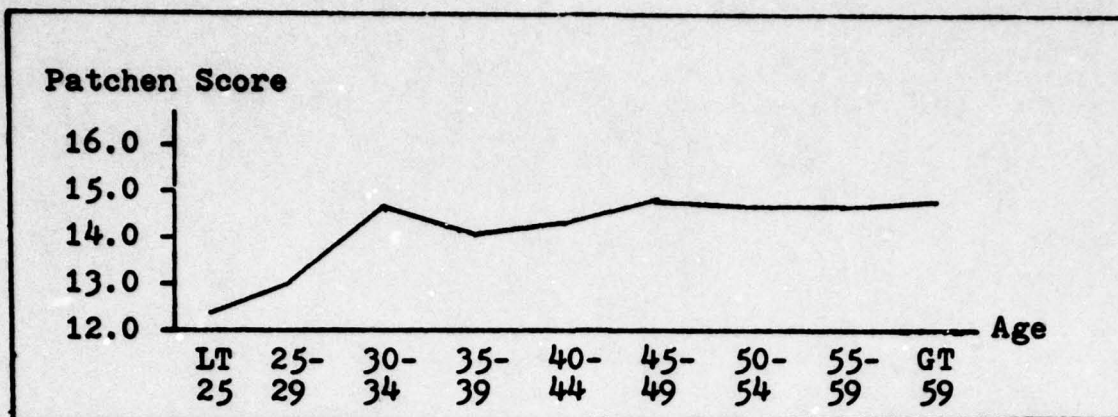


Figure 10. Relationship of Job Motivation with Age

important, and age has little further utility. Those under 30, though, do exhibit statistically significant lower scores than their older counterparts.

Divisional Differences by Homogeneous Groups: Patchen Job Motivation Criterion. Table F-1 in Appendix F provides the results of ANOVAs for the eight AID-defined homogeneous groups for each year's measurement. Only one group (1978 S&Es, grade GS-13) reached statistical significance ($p=.055$) in the test of divisional differences. Given the only marginal significance of this test and the fact that the differences were not repeated in the 1979 measurement (FE had the highest score on the 1978 measurement), it can only be concluded that there are not any significant differences among the divisions in the job motivation scores of their employees.

The second test made with these homogeneous groups was to examine for longitudinal change in scores from 1978 to 1979 for each division. These results are provided in Table XXI. As was the case for job satisfaction, none of the changes for

Table XXI
Longitudinal Change for Homogeneous Groups:
Patchen Job Motivation Criterion#

Group	Short Name	Means: 1979-1978 (t-value)*		
		FX	FB	FE
1	Older, non-S&Es who are better educated	-.49 (-.63)	-.12 (-.12)	-.01 (-.02)
2	Older, non-S&Es, less educated & assigned to	-.46 (-.55)	-.11 (-.10)	-.37 (-.44)
3	Older, non-S&Es, less educated & assigned to Div LT 4 years	2.70 (1.28)	-1.46 (-.76)	1.32 (.59)
4	Older S&Es, GS 8-12 or GS-14, in Div LT 6 mos or GT 4 years	.58 (.60)	.24 (.25)	.64 (.49)
5	Older S&Es, GS 8-12 or GS-14, in Div 6 mos - 4 years	-1.57 (-1.14)	1.91 (1.51)	1.32 (1.35)
6	Older S&Es, GS-13s	1.12 (1.53)	.46 (.57)	-.28 (-.25)
7	Younger employees w/ PhD or working on an advanced degree	.01 (.00)	-.24 (-.21)	.53 (.79)
8	Younger employees w/ BS or MS terminal degree	-.43 (-.40)	.21 (.11)	-1.17 (-.62)
<p># The n's associated with these tests are provided in Table F-1 (Appendix F)</p> <p>* None of these tests are statistically significant</p>				

any of the groups was statistically significant.

Discussion. If anything, the job motivation scores were even more stable than the job satisfaction scores. From these data it appears that the team building intervention has had little effect on this dimension of organizational change.

The range of possible reasons for the apparent failure of the OD program to affect the Patchen measure parallel those discussed under the Hoppock measure. A major reason is the apparent difficulty inherent in an interpersonal type of intervention affecting job motivation. Patchen [1970] postulated that job motivation may be related to an individual's need for achievement--a personality trait whose strength is relatively fixed for adults [McClelland et al., 1953]. If this is the case, it is unclear how job motivation could be strongly affected by OD or most other organizational change mechanisms.

AID Splits on Organizational Climate Factor One (F1).
Immediate Work Group. Five homogeneous groups were developed from the AID runs on organizational climate Factor One (F1). This factor deals with an individual's perceptions of his/her immediate work group. The mean scores for the five groups (see Figure F-2, Appendix F) ranged from -1.05 to +.33 [Note: the reader will recall that these are standardized scores; see page 74]. In contrast to the Hoppock and Patchen results, age played a lesser role in predicting an individual's feelings about his/her immediate work group. Although the demographics associated with high F1 scores included age and age-related

variables such as the length of time assigned to either the laboratory or the division, many of the observed relationships are not linear, and the most powerful predictor, educational level (accounting for almost four percent of the total variance in F1 scores), is not strongly correlated with age for this sample ($r=.12$).

An example of an interesting non-linear relationship is that of education and F1 score. Figure 11 displays the relationship (for the total sample) between F1 score and educational

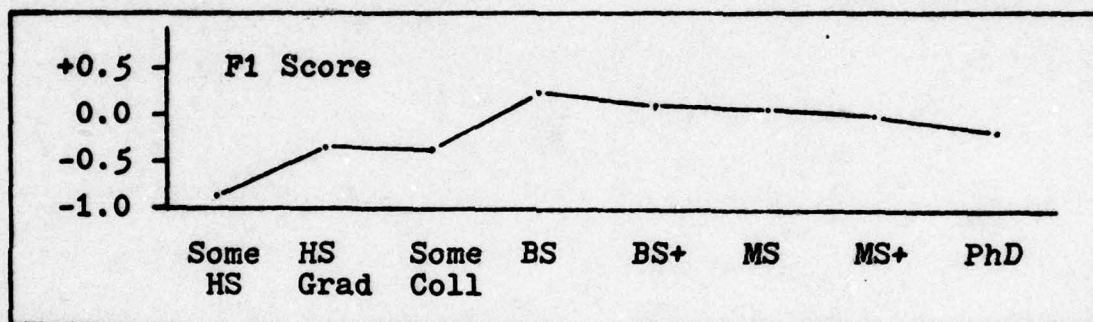


Figure 11. Relationship of Organizational Climate Factor One Scores (Immediate Work Group) and Educational Level

level. From these data it would appear that those employees most satisfied with their immediate work group are employees with college degrees, except that those with PhDs scored significantly lower than those with a Bachelor's degree. Since the vast majority of employees with BS degrees are S&Es, it may be that those S&Es with higher degrees (especially PhDs) feel somewhat alienated from their work group. This supposition receives some support from the fact that PhDs who leave

the S&E position for managerial positions within the laboratory score significantly higher on this factor.

Again, however, the reader is cautioned that the predictive power of demographic variables, while statistically significant, is not very high. For this factor only 18 percent of the total variance in F1 scores is accounted for by demographic variables and their interactions. While indicative of some interesting trends, the demographic data suggest that would-be modelers of any of the criterion variables used in this analysis would need to look beyond mere demographic variables.

Divisional Differences by Homogeneous Groups: F1. The ANOVA results for criterion variable F1 are presented in Table F-2 (Appendix F). As indicated, none of the groups exhibited significant differences for either measurement. These data imply, therefore, that the employees of all four divisions feel approximately the same about their immediate work group.

The second test made with these homogeneous groups was to examine the longitudinal change in F1 scores from 1978 to 1979 for each division. These results are provided in Table XXII. Only one change (for group 1) reached statistical significance ($p=.055$) and that change was a decrease for FX. Several other changes were fairly large, but they failed to reach statistical significance.

Discussion. From these data it is possible to identify the group most responsible for the overall decline on this

Table XXII
Longitudinal Change for Homogeneous Groups: Organizational
Climate Factor One (Immediate Work Group), F1

Group	Short Name	Means: 1979-1978 (t-value)#		
		FX	FB	FE
1	College grads, BS-MS+ in Lab LT 6 yrs or GT 10 years & in Div GT 4 yrs	-.45 (-1.91)*	-.28 (-1.54)	-.24 (-.89)
2	College grads, BS-MS+ in Lab LT 6 or GT 10 years and in Div LT 4 years	-.08 (-.37)	-.28 (-.77)	.26 (.71)
3	College grads, BS-MS+ in Lab 6-10 years	-.46 (-1.40)	.35 (.70)	-.49 (-1.49)
4	HS-some college, GS 2-11 & GS-13s, either LT 25 yrs old or 50-54	.04 (.13)	.36 (.68)	.55 (1.21)
5	HS-some college, GS 2-11 & GS-13s, either 26-50 or GT 54 & not an S&E	-.03 (-.09)	.14 (.43)	-.22 (-.73)
*p=.055				
# The n's associated with these tests are provided in Table F-2, Appendix F				

factor for FX. Table XXII indicates that group 1 accounts for much of the overall decline, with group 3 close behind. Since both these groups are primarily comprised of S&Es, the data suggest that S&Es in FX (as a group) were less satisfied with their immediate work group in 1979 than in 1978. The writer has no ready explanation for the fall in F1 scores for FX employees.

Curiously, none of the homogeneous groups in FE showed a positive change on this factor that was even close to reach-

ing statistical significance. Unless FE was originally (pre-OD) well behind the other divisions on this factor, it appears that participation in the OD program has not impacted how employees rate their immediate work group on such issues as friendliness, helpfulness, willingness to exchange ideas, trust, and sharing. Since team building is directed at these types of issues, the failure of the data to support positive change on this dimension of organizational climate casts some serious doubts on the efficacy of this particular OD program. Further discussion of this topic is deferred until later in the chapter.

AID Splits on Organizational Climate Factor Two (F2). Employee/Supervisor Interaction. Five homogeneous groups were formed from the AID runs on organizational climate Factor Two (F2). This factor represents an employee's perception of the quality of the employee/supervisor interaction within the laboratory. The mean scores for the five groups (see Figure F-3, Appendix F) ranged from $-.56$ to $+.33$, or almost nine-tenths of one standard deviation. As before, demographic variables and their interactions accounted for only a small portion of the total variance in F2 scores (slightly over 14 percent). Nevertheless, the data imply that an individual's feelings about the quality of the interaction with his/her supervisor (receiving credit for work accomplished, supervisor paying attention, allowing a high degree of autonomy, rewarding rather than criticizing, and general friendliness) are positively related to grade, age, length of time assigned to both

the laboratory and the division, and education. Of these, grade has the most predictive power, accounting for just under three percent of the total variance in F2 scores. As Figure 12 depicts, the relationship between grade and F2 scores sug-

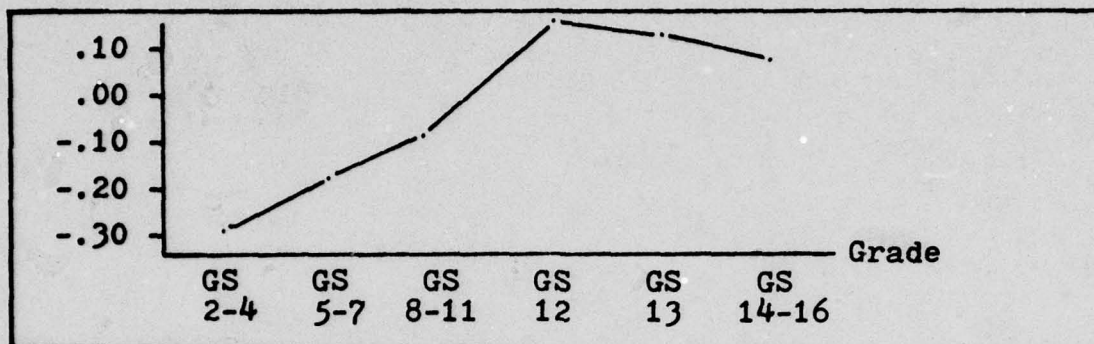


Figure 12. Relationship of Organizational Climate Factor Two (F2), Employee/Supervisor Interaction, and Grade

gests a distinct dichotomy between those in grades 2-11 and those in grades 12-16. Perhaps some of this dichotomy is due to empathy. Many of those employees in grades 12-16 are themselves supervisors, familiar with the often conflicting demands of higher management and employee desires. Even among those in the lower grades (GS 2-11), employees with higher levels of education (presumably younger employees, many destined for managerial positions in the future) score significantly higher than those with lower educational level.

Divisional Differences by Homogeneous Groups: F2. The ANOVA results for criterion variable F2 are presented in Table F-3, Appendix F. As indicated, none of the groups exhibited significant differences for either measurement. These data imply, therefore, that employees of the divisions feel approxi-

mately the same about the quality of the interaction with their supervisor.

The test of longitudinal change from 1978 to 1979 for F2 yielded the results contained in Table XXIII. Only one change (group 3 in division FB) reached statistical significance, and that change was an increase whose sampling error

Table XXIII
Longitudinal Change for Homogeneous Groups: Organizational
Climate Factor Two (Employee/Supervisor Interaction)

Group	Short Name	Means: 1979-1978 (t-value)#		
		FX	FB	FE
1	Higher grade college grads, not 25-29 or 40-44, not in div 4-5 yrs	.02 (.07)	-.06 (-.23)	.22 (.88)
2	Higher grade college grads, not in div 4-5 and not 25-29 or 40-44, (BS, MS+, PhD)	.08 (.24)	-.01 (-.03)	-.06 (-.23)
3	Higher grade college grads 25-29 or 40-44	-.33 (-1.16)	.65 (2.77)**	-.48 (-1.13)
4	Lower grade, less educated employees, LT 54, not in div 4-5 yrs; in Lab LT 2 or 6-25 yrs	.37 (1.11)	.05 (.17)	-.19 (-.66)
5	Same as above, but in lab 2-5 or GT 25 years	.16 (.27)	-.09 (-.19)	.61 (.87)
**p=.01				
# The n's associated with these tests are provided in Table F-3, Appendix F				

was estimated at less than p=.01. Given the almost average scores for this group in 1978, the much higher scores for 1979

cannot be attributed to regression toward the mean. The writer has no ready explanation for the increase in F2 scores for this group, although the smaller number of employees in 1979 (24 vs. 15), and the narrow age bands which define this group, might limit the precision of this test. It is quite possible that individuals who comprised this group in 1979 were an entirely different set from those in 1978. Another measurement in 1980 might aid in clarifying this situation.

Discussion. From these data it appears that the team building intervention has had negligible effect on FE for this criterion. Not only are the scores of FE groups on this factor approximately the same as the other divisions, the changes in scores from 1978 to 1979 do not reflect any significant increases for FE. Apparently FE supervisors have not been able to convey to their subordinates all of the positive aspects of the employer/employee relationship that are inherent in the goals of team building OD interventions.

AID Splits on Organizational Climate Factor Three (F3), Organizational Warmth. Four homogeneous were formed from the AID runs on the organizational climate Factor Three (F3) data (see Figure F-4). This factor is an overall indicator of such things as how effective an employee perceives the promotion system to be, the quality of laboratory rewards, the amount of loyalty and pride within AFFDL, the level at which decisions are made, etc. (hence the term "organizational warmth" for this factor). The mean standardized scores for the four homogeneous

groups ranged from $-.24$ to $+.46$, or seven-tenths of one standard deviation.

Demographic variables and their interactions accounted for a somewhat larger portion of the total variance in F3 scores than was encountered with the other criteria: slightly over 24 percent. The best predictor, accounting for almost six percent of the total variance, was position within the laboratory. As Figure 13 indicates, all the positions yielded approximately equal scores except for S&Es and Group Leaders, whose scores are markedly lower. Interestingly, for this latter

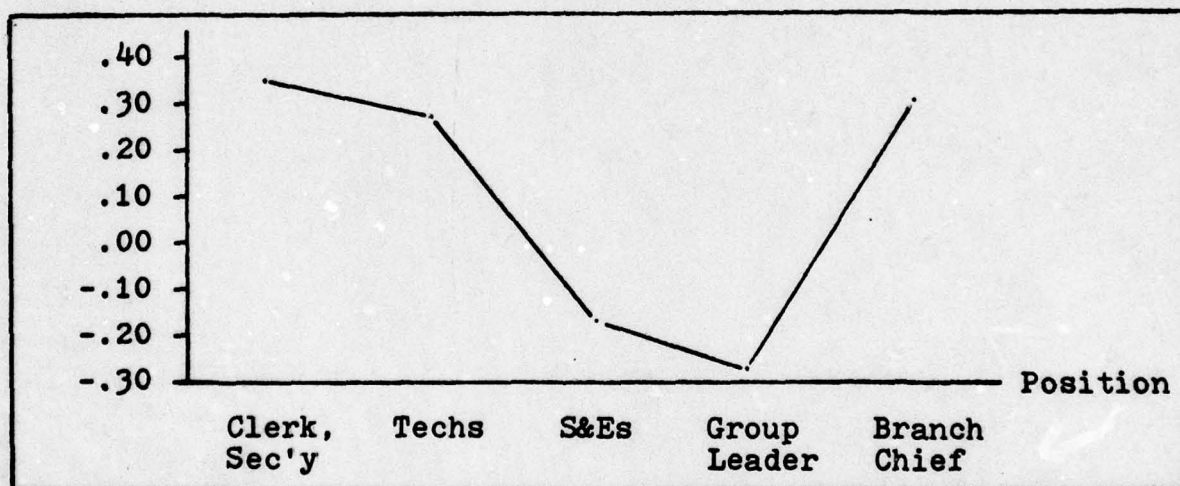


Figure 13. Relationship of Organizational Climate Factor Three (F3), Organizational Warmth, and Position Within AFFDL

group (S&Es and Group Leaders) the length of time assigned to the laboratory was the next best predictor of F3 scores. It displayed a curvilinear relationship; those assigned to the laboratory less than two or more than 25 years displayed significantly higher scores than those in the laboratory 2-25

years. This is apparently another manifestation of the association between socialization and dependent variables such as satisfaction, etc., that occurs in many organizations.

This U-shaped relationship for S&Es and Group Leaders is contrasted, though, with an almost totally opposite relationship for the other employee positions. The next best predictor for Secretaries, Technicians, and Branch Chiefs was also the length of time assigned to the laboratory, but unlike S&Es and Group Leaders this group displayed higher scores for those in the laboratory 11-25 years than those in 6-10 or greater than 25 years. The exact reason for this difference is unknown, but it may again be related to the dearth of promotions for S&Es in the age category previously mentioned.

The reason for the lower F3 scores for S&Es and Group Leaders is more easily explained. Since promotion-related items load heavily on this factor, and S&Es have been limited in their promotion opportunities, the dissatisfaction engendered by this situation might well be responsible for the lower F3 scores for S&Es and Group Leaders.

Divisional Differences by Homogeneous Groups, Organizational Warmth, F3. The ANOVA results for criterion variable F3 are presented in Table F-4, Appendix F. Only one of the groups (group 4) exhibited any significantly different scores among the divisions on the 1978 measurement. For this test, division FB scored significantly higher than FX and FG, producing the significant ANOVA results. While the 1979 differ-

ences among divisions were still fairly pronounced, they were not great enough to reach statistical significance. These data imply that as of the time of the second measurement significant differences among the divisions on this criterion did not exist.

The test of longitudinal change from 1978 to 1979 for F3 produced the results contained in Table XXIV. No changes were statistically significant. In fact, the stability of this factor

Table XXIV
Longitudinal Change for Homogeneous Groups: Organizational
Climate Factor Three (Organizational Warmth)#

Group	Short Name	Means: 1979-1978 (t-value)*		
		FX	FB	FE
1	Sec'ys, Techs & Br Chs in lab LT 5 yrs or 11-25	.01 (.04)	.10 (.44)	-.24 (-.94)
2	Sec'ys, Techs & Br Chs in lab 6-10 or GT 25 yrs	-.01 (-.02)	.16 (.47)	.53 (.84)
3	S&Es and Gp Ldrs in lab LT 2 or GT 25 years	-.48 (-1.03)	.25 (.57)	-.47 (-1.23)
4	S&Es and Gp Ldrs in lab 2-25 years	-.01 (-.06)	-.02 (-.12)	.10 (.42)
*None of the differences are statistically significant				
# n's associated with these tests are provided in Table F-4, Appendix F				

suggests that "warmth" (or the lack thereof) may be one of the most enduring qualities of an organization.

Discussion. Again it appears that the team building intervention has had little effect on this criterion. Employees in FE do not score higher than employee of the other divisions

on this factor, nor did FE exhibit any significant positive change from 1978 to 1979.

However, it may be unrealistic to expect a factor which contains several promotion-related items to be influenced by an interpersonal intervention. OD cannot produce changes in the basic Civil Service promotion structure, and this structure is the source of much of the discontent in the S&E ranks. Although comments were not solicited in the survey instrument, some respondents did provide them on their completed questionnaires. Of all the items in the instrument, the promotion-related ones were responsible for most of the comments--all negative. In response to the question in the instrument concerning the effectiveness of the promotion system, the following comments were representative:

"No promotions in 18 years" [S&E in FB for 16-20 years]

"Politicians get promoted, not the workers" [S&E in FE for 16-20 years]

"Almost no news on promotions, so can't tell!" [S&E in FG for 6-10 years]

"The persons who do very little get all the consideration" [Secretary in FB for more than 25 years]

"There is age and reverse race discrimination" [S&E in FX for 6-10 years]

In fact, of all 30 organizational climate items, the two concerning promotion and rewards were the lowest and third lowest scoring items in the survey. While OD might be expected to induce employees to better accept the system, there is little that OD can do to change the situation.

Unfortunately, the disillusionment AFFDL employees apparently experience with the present reward system has far-reaching consequences. As Porter et al., report:

Individuals react to the offering of important rewards [pay, promotion, fringe benefits] by doing what is required to obtain them. Thus, how an organization distributes rewards has a very important influence on the behavior of individuals. Stated simply, organizations tend to motivate the kind of behavior they reward. [1975:343] [Emphasis in original]

From the unsolicited comments it appears that some AFFDL employees do not perceive a strong relationship between performance and promotion. This would seem to guarantee that motivation to perform would suffer. Although interesting and of paramount importance to top-level management, this topic is too complex to be adequately treated in this thesis. The interested reader is referred to Stahl [1976] and Corbin [1977] for a more detailed analysis of this relationship.

AID Splits on Organizational Climate Factor Four (F4), Organizational Communication. Six homogeneous groups were formed from the AID runs on the F4 data (see Figure F-5, Appendix F). This factor is an indicator of how an individual perceives the adequacy of communication within his/her branch, group, and division. The mean standardized scores for the six groups ranged from $-.33$ to $+.53$.

Again, as with the preceding criteria, demographic variables were only fair predictors of this criterion score. Demographic variables and their interactions accounted for slightly less than 19 percent of the total variance in F4 scores; the

best demographic predictor, grade, accounted for 3.6 percent of the variance. As Figure 14 indicates, all grades scored about equally on this factor except for GS-14s and above, who scored significantly higher than any other grade. It is not surpris-

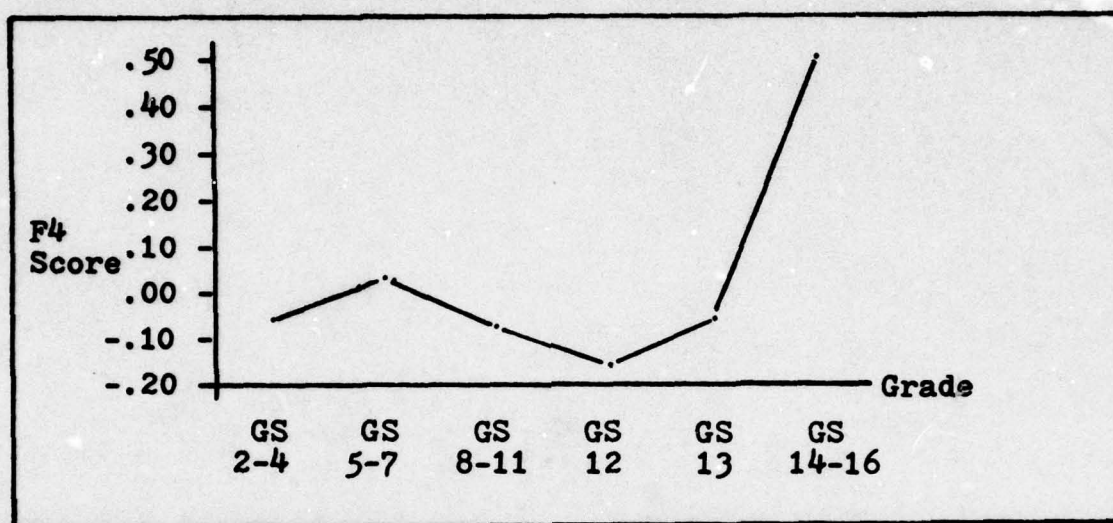


Figure 14. Relationship of Organizational Climate Factor Four (Organizational Communication) and Grade

ing that those in the upper grades scored so high on this factor since all GS-14s and above are in top managerial positions where information access is presumably not a problem. What is surprising, however, is the identity of the next best predictor of F4 scores for those in grades GS-13 and below. The predictor Position split Secretaries and S&Es (low scorers) from Technicians, Group Leaders, and Branch Chiefs (high scorers). A subsequent split showed that S&Es were again the lowest scoring group on this criterion. Apparently the isolation that S&Es feel from their immediate work group and their perception of the lack of "organizational warmth" (see the discussions of F1 and F3) is also manifested in their perception of the in-

adequacy of organizational communication.

Divisional Differences by Homogeneous Groups, F4, Organizational Communication. The ANOVA results for criterion variable F4 are presented in Table F-5, Appendix F. Only one F-test reached statistical significance: GS-14s and above in both FE and FG scored significantly higher than those in FX on this factor in the 1979 measurement, accounting for the ANOVA results. In addition, several other comparisons show that FE and FG scored considerably higher than one of the groups from the control divisions. While none of these other comparisons reached statistical significance, the general trend of the data confirms the overall ANOVA results described in the beginning of this chapter: FE and FG appear to score higher on this factor of organizational climate than do the control divisions.

The tests of longitudinal change from 1978 to 1979 for F4 confirms the hypothesis that significant change on this criterion has occurred for FE and not for the control divisions. The results of the t-tests of change for each group are presented in Table XXV. One change was statistically significant at the $p=.05$ level, and one change just missed reaching this level. Both homogeneous groups were from FE. In addition, all six groups in FE showed some positive change on this criterion. Surprisingly, the group showing the greatest change was comprised of S&Es. Such a result suggests that the team building intervention may have begun to be successful in increasing the "openness" of the division in such a manner that

Table XXV
Longitudinal Change for Homogeneous Groups: Organizational
Climate Factor Four, Organizational Communication#

Group	Short Name	Means: 1979-1978 (t-value)		
		FX	FB	FE
1	GS-14s & above, plus military equivalent	-.39 (-1.12)	.08 (.24)	.35 (.87)
2	GS-13s & below, in lab LT 2 or GT 16 yrs, Techs, Gp Ldrs, & Br Chiefs	-.07 (-.17)	-.09 (-.31)	.73 (1.97)
3	GS-13s & below, in lab 2-15 yrs, Techs, Gp Ldrs, & Branch Chiefs	-.19 (-.34)	.28 (.83)	.20 (.70)
4	Mostly younger GS-13s & below; Sec'ys & Other	.61 (.54)	-.45 (-1.34)	.19 (.31)
5	Mostly younger S&Es, GS-13 and below	.15 (.70)	.34 (1.51)	.65 (1.96)**
6	Mostly older S&Es, Sec'ys & Other	.17 (.77)	-.06 (-.23)	.22 (.60)
**p=.05				
# n's associated with these tests are provided in Table F-5, Appendix F				

at least some S&Es (especially the younger ones) feel less isolated.

Discussion. These data suggest that the team building intervention has had a significant effect on openness and general communication processes within the laboratory. Both treatment divisions are generally the highest scorers on this factor, and significant positive change on this criterion has occurred in FE since 1978. The creation of an environment

where openness is the rule, information is widely shared, and communication among "team" members is encouraged is one of the critical goals of many team building interventions [McGill, 1977]. Yet, this is only an initial step in the Lewinian process of "unfreeze-change-refreeze" (see Chapter II). It is puzzling that although substantial positive change has occurred in this dimension, the OD program has had so little impact on all the criteria previously examined. Possible reasons for this situation are discussed later in the Chapter.

AID Splits on Organizational Climate Factor Five, F5, Supervisory Support. Seven homogeneous groups were formed from the AID runs on the organizational climate factor five (F5) data (see Figure F-6, Appendix F). The reader may recall from Chapter III that this factor represents an employee's perception of the amount of supervisory support he/she receives. It is comprised of items concerning the standards set by one's supervisor, the frequency with which the supervisor encourages an employee's best efforts, the amount of pressure applied to improve personal performance, and the extent that supervisors encourage subordinates to exchange ideas and opinions. The mean standardized scores for the seven groups ranged from -.43 to +.61.

The relatively poor predictive capability of demographic data for F5 scores parallels the results observed with the other criteria. Demographic variables and their interactions accounted for almost 19 percent of the total variance in F5

scores. Education was the single best demographic predictor, accounting for slightly over four percent of the variance. The AID split on Education (see Figure 15) is quite clear. Those employees without a college degree exhibit much higher scores than those with at least a Bachelor's degree. Subsequent AID splits reveal few surprises. As with other relationships ex-

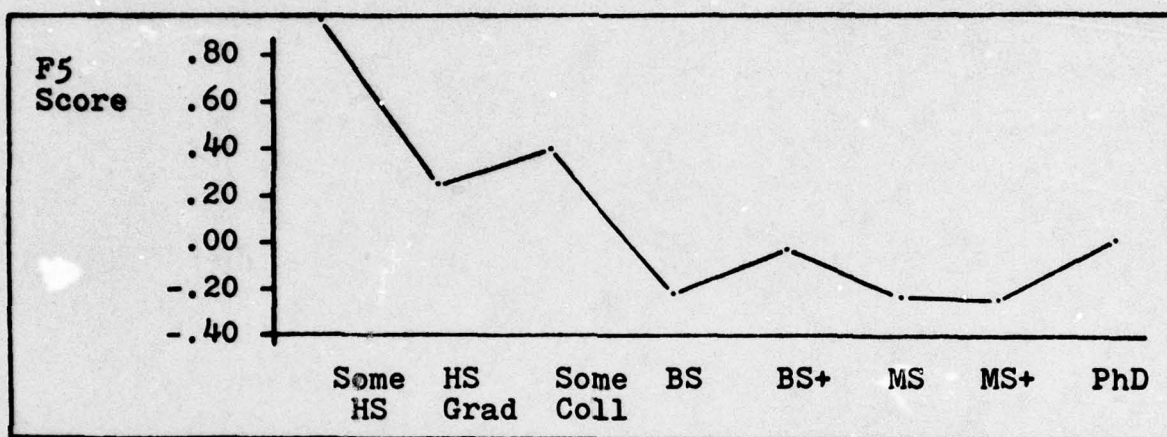


Figure 15. Relationship of Organizational Climate Factor Five (Supervisory Support) and Educational Level

amined, the high degree of correlation between education and grade suggests that those employees with more education are either managers now, or are destined for the managerial ranks. Their disenchantment with their level of supervisory support (as compared with employees without college degrees) may be a reflection of their perception that they would be (or are) more attentive to this area if they were in a supervisory position.

Divisional Differences by Homogeneous Groups, Supervisory Support, F5. The ANOVA results for criterion variable F5 are presented in Table F-6, Appendix F. Only one test reached

statistical significance: the 1979 measurement exhibited significant differences among the four divisions for a group comprised of Group Leaders and below in the grades of GS 8-12 or GS-14 who had been in the laboratory greater than two years. A test of the differences in their mean scores revealed that differences exist at a $p=.005$ level. Further analysis revealed that group members from both FX and FE scored significantly higher than those from either FB or FG on this factor. Since pre-OD scores were not available to analyze the situation further, an examination of the change in group scores from 1978 to 1979 was then accomplished.

The tests of longitudinal change for each group produced the results depicted in Table XXVI. Only one change was statistically significant, and even that change was only barely significant ($p=.051$). An examination of that particular group (group 7 in FE) revealed that a one-third greater sample size was obtained for the 1978 versus the 1978 measurement. Such a situation could be caused by either a greater response rate in 1979 (unlikely, given the identical overall response rates for both years), or perhaps by an influx of employees whose demographics had changed enough in the intervening year to cause a change in group membership to occur due to the restrictive membership criteria which defines this group. The latter reason is more likely, and as a consequence, this result has been discounted.

Table XXVI
Longitudinal Change for Homogeneous Groups:
Organizational Climate Factor Five#

Group	Short Name	Means: 1979-1978 (t-Value)		
		FX	FB	FE
1	Lower educated employees in Div LT 6 months or 1-3 years	-.44 (-.78)	.08 (.24)	-1.13 (-1.71)
2	Lower educated employees in Div 6 mos - 1 year or GT 3 years	.14 (.46)	.09 (.26)	.21 (.83)
3	Higher educated employees, in Lab LT 2 years	.38 (.88)	.06 (.11)	.24 (.60)
4	BS+ or PhD employees in Lab GT 2 yrs, GS 8-12 or GS-14+, Gp Ldr & below	.33 (.94)	-.34 (-.87)	.01 (.03)
5	BS+ or PhD employees, mostly GS-13s, in Lab GT 2 yrs, Gp Ldr & below	-.31 (-.78)	.38 (.95)	-.31 (-.39)
6	Mostly younger Gp Ldrs & below, in Lab GT 2 yrs w/ BS,MS,MS+	.20 (.74)	.53 (1.08)	.41 (1.05)
7	Mostly older GP Ldrs & below, in Lab GT 2 yrs, w/ BS,MS,MS+	.27 (.97)	-.11 (-.27)	-.73 (-2.19)*
# The n's associated with these tests are provided in Table F-6, Appendix F				
*p=.051				

Discussion. The results of the statistical tests on this criterion are inconclusive. FE (and FX) contains one group that scored significantly higher than the divisional

mean on this dimension of organizational climate, but the same group from the other treatment division, FG, was actually lower than the mean. Since a 1978 measurement for FG was not obtained, it is impossible to fully interpret these results.

The check of longitudinal change is unequivocal, though. No positive change had occurred for any FE groups (in fact, one had a significant negative change). These results imply that either all the effect of the OD intervention had taken place prior to the 1978 measurement, or the effect of the OD program on this criterion was negligible. Although the former reason cannot be ruled out, the results of all the criteria to this point, especially F4, indicate that the process of OD-induced change may still be taking place within the laboratory. This researcher, therefore, believes that up to the point of the second measurement, team building has had little or no effect on AFFDL employees' perceptions of the supervisor's supportiveness.

AID Splits on Productivity Factor One (P1), Management Studies. On productivity factor one (P1), as with all the productivity factors, relatively few homogeneous groups were formed from the AID runs. As Figure F-7 (Appendix F) depicts, only two groups were formed, using Position as the best predictor variable. Position split all the S&Es, Group Leaders, and Branch Chiefs (and a small number--10--who indicated "Other") into S&Es and everything else. The mean scores for these two groups were $-.14$ and $+.23$ respectively.

Although Position was the best demographic predictor of P1 scores, it accounted for only about 3.5 percent of the total variance. As Figure 16 shows, however, the separation of groups into S&Es and all other positions is quite distinct.

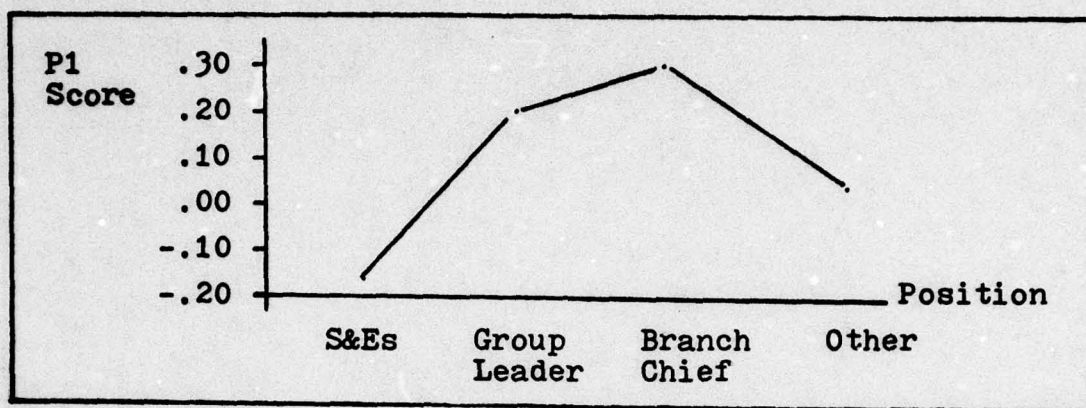


Figure 16. Relationship of Productivity Factor One (P1), Management Studies, and Position

The next AID splits were on division membership for S&Es and the year of the measurement for the other positions--each of which was cause for termination in accordance with the ground-rules for grouping established in Chapter III.

Since P1 represents management studies--in-house studies, managerial assessments, presentations to general officer-level audiences, etc., it is not surprising that managers were the highest scoring group on this factor. Branch Chiefs can be expected to be involved with almost every managerial assessment performed in their branch. The same can be said for general officer-level presentations. S&Es, while involved to a lesser extent in these tasks, tend to exhibit less uniform application to these types of activities. According to the

AID data, experienced, generally older S&Es have significantly greater involvement in management studies than do younger, less experienced S&Es.

Divisional Differences by Homogeneous Groups: P1. Management Studies. The ANOVA results for criterion variable P1 are presented in Table F-7, Appendix F. One of the four tests reached statistical significance: the 1978 measurement for S&Es. On this measurement the S&Es from FE scored significantly higher than those from FX, and significantly higher than the overall divisional mean at a level of $p=.04$. While FE still scored significantly higher than FX on the 1979 measurement, a slight rise in FB scores, coupled with a small drop in FE scores, and the addition of relatively low scores from FG all combined to reduce the 1979 ANOVA below the level of statistical significance.

The tests of longitudinal change for both groups are presented in Table XXVII. No changes were statistically signifi-

Table XXVII
Longitudinal Change for Homogeneous Groups: Productivity
Factor One, (P1), Management Studies#

Group	Short Name	Means: 1979-1978 (t-value)*		
		FX	FB	FE
1	Group Leaders, Branch Chiefs & Others	-.46 (-1.05)	-.59 (-1.84)	-.71 (-1.69)
2	S&Es	.02 (.04)	.01 (.04)	-.04 (-.16)
*No differences are statistically significant				
# n's are provided in Table F-7, Appendix F				

cant, although the scores for group one dropped substantially for all three divisions from 1978 to 1979.

Discussion. From these data it appears that team development had little effect on this productivity dimension. While somewhat inconclusive due to the lack of a 1978 measurement for FG, the data suggest that no significant differences exist between the treatment and the control divisions, and that no positive change had occurred for FE on the criterion over the past year. Since productivity is an "end-result" variable in the model of organizational change used in this study (see Chapter I), the caveats on change occurring prior to the 1978 measurement do not apply in this instance. Not only is productivity output at the end of the causal-intervening-end result chain, but also the nature of the items comprising this factor (asking how many outputs were accomplished over the past year), and the lag time inherent in some outputs (e.g., especially long-term studies or publications in refereed journals) almost guarantees that productivity items will be the last to reflect changes resulting from the OD program. Another measurement is required to resolve remaining ambiguities in this criterion.

AID Splits on Productivity Factor Two (P2), External Professional Development. Three homogeneous groups were formed from the AID data on P2 (see Figure F-8, Appendix F). This factor represents an employee's activities involving papers published in professional or technical journals, presentations at technical conferences or symposia, and to a lesser

extent, participation in professional or technical committees external to the laboratory. These categories suggested the name "External Professional Development" for this factor. The mean standardized scores for the three groups ranged from $-.28$ to $+.96$.

The best demographic predictor for this criterion was educational level. It was a relatively powerful predictor, accounting for almost 13 percent of the total variance in P2 scores. As Figure 17 indicates, performance in the P2 categories exhibits a generally linear relationship with educational level up through work beyond a Master's degree. At the PhD level, though, the scores are significantly higher than any other category--an almost certain manifestation of the interest, aptitude, and experience of those who possess a PhD degree.



Figure 17. Relationship of Productivity Factor Two (P2), External Professional Development and Education

For those without PhDs, the next best demographic predictor was grade. Those in grades GS-13 and above scored significantly higher on this factor than those in grades GS-12 and

below. Further demographic splits were less powerful (and consequently not used), but they tended to indicate that age was positively associated with P2 scores for those in the higher (GS-13 and above) grades, and negatively associated with P2 scores for those in grades GS-12 and below. Which of these variables (productivity or grade) is the cause and which is the effect is impossible to determine from the data available. Curiously, Position as a predictor was never significant in the AID data for the P2 criterion.

Divisional Differences by Homogeneous Groups, P2, External Professional Development. The ANOVA results for criterion variable P2 are presented in Table F-7, Appendix F. One of the tests for 1978 and two of the tests for 1979 reached statistical significance, indicating differences among the divisional groups. None of these differences, though, were constant from 1978 to 1979. This may reflect the fact that scores (output) for this variable are either predicated on opportunity, or are cyclical in nature. For instance, group 2 (non-PhDs, GS-13 and above) scores for 1978 indicated that FE scored significantly higher than the divisional average, while no such significant differences existed for the 1979 measurement. For the other two groups, the addition of FG in the 1979 measurement contributed to the significance of the ANOVA results. In both groups FG had the lowest P2 scores. While the lack of a 1978 measurement for FG introduces uncertainty into the interpretation of these results, one must question the opportunity of FG personnel

to contribute outputs associated with this factor. While AFPDL personnel were unable to identify reasons for the significantly lower output of FG employees on this factor, further investigation is clearly warranted.

The tests of longitudinal change on this factor for the three homogeneous groups (Table XXVIII) revealed that no changes were statistically significant, although the trend for non-PhDs in FE indicated substantially lower scores.

Table XXVIII
Longitudinal Change for Homogeneous Groups: Productivity
Factor Two (External Professional Development)#

Group	Short Name	Means: 1979-1978 (t-value)*		
		FX	FB	FE
1	PhDs	.14 (.21)	-.31 (-.43)	.63 (1.06)
2	Non-PhDs, GS-13s and above	.26 (1.72)	.17 (.68)	-.35 (-1.36)
3	Non-PhDs, GS-12s and below	.05 (.34)	.50 (1.48)	-.20 (-.79)
* No differences are statistically significant				
# n's for these tests are provided in Table F-7, Appendix F				

Discussion. Again, the data are inconclusive. Although no significant changes were observed for any of the three divisional groups on this factor, scores for FE dropped substantially (although not quite statistically significant), and the scores of FG were statistically lower than the divisional

mean for two of the three groups. While two measurements hardly constitute a trend, the results indicate that another measurement should be obtained to confirm or deny that OD-exposed divisions are suffering a productivity decrease. The lack of a 1978 measurement hampers the development of an explanation for the low scores of FG on this factor, but again, the data may be the start of a trend which can only be ascertained by another measurement. While the data suggest that OD has not had a positive effect on this factor, it is too early to tell if it has had a negative effect.

AID Splits on Productivity Factor Three, P3. Technical Data. Two homogeneous groups were formed from the AID data on Productivity Factor three (P3) (see Appendix F, Figure F-9). This factor is comprised almost entirely of questionnaire items 52 and 53: technical reports, technical memorandums, and test data reports. The mean standardized scores for the two groups were $-.33$ and $+.03$. The former group consisted of Group Leaders, Branch Chiefs, and those 10 individuals who marked "Other" to Question seven. The higher scoring group was comprised solely of S&Es. The AID split on Position accounted for just over five percent of the total variance in P3 scores. Given the nature of this factor, the results of Figure 18 are hardly surprising. S&Es, whose primary outputs consist of the technical products included in this factor scored significantly higher than personnel in more management-related positions.

Subsequent AID splits quickly indicated that division of

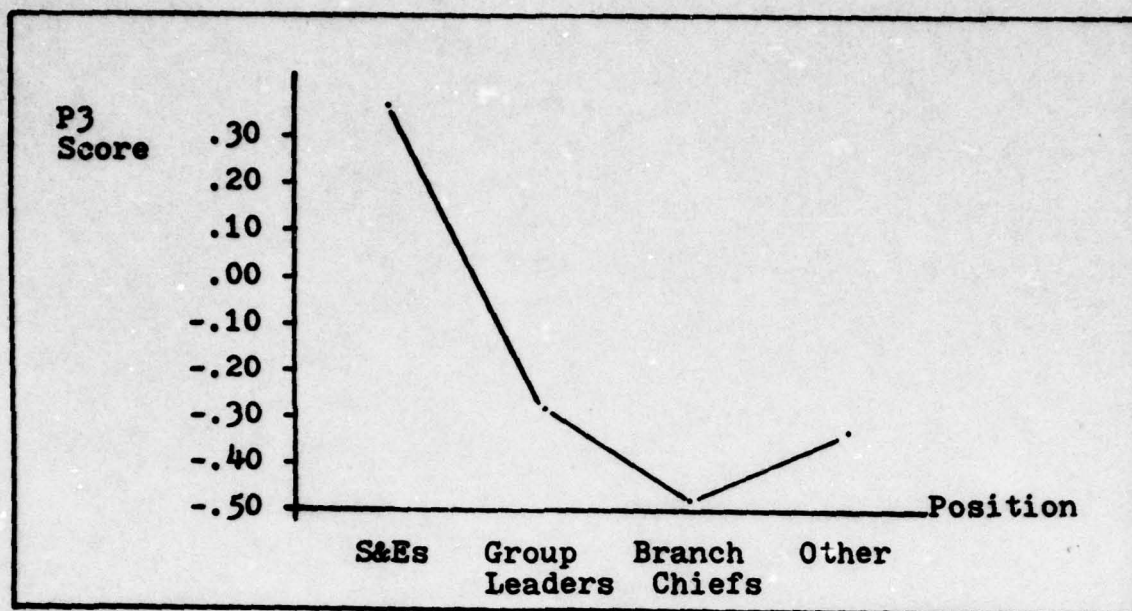


Figure 18. Relationship of Productivity Factor Three (Technical Data) and Position

assignment was an important predictor of P3 scores, particularly for S&Es. This occurrence was one of the "stopping rules" for defining homogeneous groups (see Chapter III), so further splits were ignored.

Divisional Differences by Homogeneous Groups, P3, Technical Data. The ANOVA results for criterion variable P3 are presented in Table F-7, Appendix F. One of the four tests revealed a significant difference in mean scores among divisions: the 1979 measurement for S&Es. The reason for the high level of significance ($p=.0002$) was because the mean score of S&Es in FG was significantly lower than that of any other division. Since FG was not included in the 1978 measurement, it is impossible to be precise about the reasons for the poor performance of its S&Es on this factor, but it again indicates the need

for further investigation.

The tests of longitudinal change for this factor are summarized in Table XXIX. As before, although no changes are statistically significant, the changes for both sample groups in FE are negative.

Table XXIX
Longitudinal Change for Homogeneous Groups: Productivity
Factor Three (Technical Data)#

Group	Short Name	Means: 1979-1978 (t-value)*		
		FX	FB	FE
1	Group Leaders, Branch Chiefs, & Other	.01 (.06)	.02 (.06)	-.12 (-.58)
2	S&Es	-.04 (-.34)	.00 (.00)	-.26 (-1.50)
*None of the changes is statistically significant # n's for the tests are in Table F-7, Appendix F				

Discussion. Many of the comments on productivity factor two (P2) apply to P3 as well. While it is difficult to discern a trend from two measurements, it is clear that productivity has not increased in FE. It is also clear that FG scored the lowest of the four divisions on all three productivity factors. Another measurement is required, though, to resolve ambiguities in the present data and to confirm or deny a trend (either cyclical or linear) in the productivity data.

Divisional Differences by Hierarchical Groups

After examining differences by homogeneous groups, the

next step in the analysis was to reaccomplish the difference tests using hierarchical groups (Secretaries, Technicians, etc.). The reader will recall the reasons for this step from Chapter III: the intuitive appeal of these groups, especially when communicating results back to AFFDL; and, the use of hierarchical groups allows the effect of the intensity of the OD intervention to be indirectly examined. While hierarchical groups do not capture as much of the variance in criterion scores as do homogeneous groups, these two benefits outweigh the disadvantages. Accordingly, seven criteria will be re-examined using hierarchical groups: job satisfaction, job motivation, and the five organizational climate measures. Since the productivity criteria were split into essentially hierarchical groups by the AID runs, they are not repeated in the following analysis.

Job Satisfaction. The ANOVA results for the Hoppock criterion are contained in Table G-1, Appendix G. Two of the tests reached statistical significance: the 1978 test for S&Es, and the 1979 test for Branch Chiefs. In each case groups from FB had the highest job satisfaction scores, and those from FE or FX had the lowest.

The longitudinal results are contained in Table XXX. None of these results are statistically significant at the $p=.05$ level, although the positive change for Branch Chiefs in FB is close ($p=.07$).

Discussion. These data parallel the results of both the

Table XXX
Longitudinal Change for Hierarchical Groups:
Job Satisfaction (Hoppock)#

Group	Name	Means: 1979-1978 (t-value)*		
		FX	FB	FE
1	Secretaries	.30 (.23)	-.28 (-.23)	.52 (.29)
2	Technicians	.75 (.65)	.67 (.52)	1.77 (1.38)
3	S&Es	.23 (.36)	-.29 (-.51)	.58 (.68)
4	Group Leaders	-.81 (-.54)	-.47 (-.50)	-.56 (-.42)
5	Branch Chiefs	-4.00 (-.92)	3.54 (2.13)	1.00 (.71)
* None of these differences are statistically significant				
# n's for these tests are provided in Table G-1				

division-wide analysis and the homogeneous analysis. It is apparent that the team development intervention has had little effect on job satisfaction for any of the hierarchical groups. The positive effect of OD intensity is also not borne out by these data. In fact, of the managers expected to have had more frequent contact with Dr. Lehner (Group Leaders and Branch Chiefs), the scores for the group leader sample were down in all three divisions. The fall in job satisfaction scores for Branch Chiefs in FX did not reach statistical significance (too few degrees of freedom), but it was sufficient, when coupled

with an almost significant rise in scores for FB, to account for the significance ($p=.04$) of the ANOVA results. Overall, however, this analysis confirms the relative stability of the job satisfaction scores for AFFDL over the one year measurement period.

Job Motivation. The ANOVA results for the Patchen job motivation criterion are contained in Table G-2, Appendix G. None of the tests reached statistical significance, indicating a failure to reject the null hypothesis of no difference in job motivation scores for groups in any of the divisions.

A test of longitudinal change produced the results of Table XXXI. None of the indicated changes are significant.

Table XXXI
Longitudinal Change for Hierarchical Groups:
Job Motivation (Patchen)#

Group	Name	Means: 1979-1978 (t-value)*		
		FX	FB	FE
1	Secretaries	1.50 (1.82)	-.16 (-.13)	1.30 (.77)
2	Technicians	-.86 (-.80)	1.35 (1.35)	.87 (.79)
3	S&Es	.22 (.39)	.41 (.73)	-.17 (-.24)
4	Group Leaders	-.41 (-.42)	-.38 (-.25)	-1.11 (-1.11)
5	Branch Chiefs	-.17 (-.11)	-.82 (-.42)	-1.00 (-.83)
* None of the changes are statistically significant				
# n's for these tests are provided in Table G-2				

Discussion. These results, like the Hoppock results just analyzed, suggest that the team building intervention has had no significant effect on job motivation within the laboratory. As mentioned earlier in the chapter, one possible reason for this is the relationship between job motivation and the need for achievement--a personality trait whose strength is relatively fixed for adults [McClelland et al., 1953].

Curiously, the job motivation scores for Group Leaders and Branch Chiefs fell in each division for this sample. This implies that the intensity of the intervention does not have a positive effect on organizational change for this factor. This is contrary to the finding of Porras and Berg [1978]. Another measurement is required, however, to determine if the falling job motivation scores for managers is the beginning of a significant trend, or just a chance occurrence.

Immediate Work Group. The ANOVA results for F1 are contained in Table G-3, Appendix G. Only one test reached statistical significance: the 1979 measurement for S&Es. The results of this test indicate that S&Es in FX scored significantly lower than the divisional mean on this factor.

The test of longitudinal change produced the results depicted in Table XXXII. Two of the indicated changes are statistically significant: a drop in F1 scores for S&Es in FX, and a drop for Group Leaders in FB.

Discussion. These results are somewhat more illuminating than the results obtained with homogeneous groups. From

Table XXXII
Longitudinal Change for Hierarchical Groups:
Immediate Work Group (F1)#

Group	Name	Means: 1979-1978 (t-value)		
		FX	FB	FE
1	Secretaries	.07 (.21)	.40 (1.01)	.53 (1.05)
2	Technicians	-.03 (-.13)	.08 (.20)	-.05 (-.01)
3	S&Es	-.39 (-2.03)**	.03 (.18)	-.17 (-.78)
4	Group Leaders	-.36 (-.86)	-.79 (-2.35)**	.29 (.63)
5	Branch Chiefs	.54 (1.32)	-.36 (-1.20)	-.40 (-.94)
**p=.05				
# n's for these tests are provided in Table G-3				

these data it is readily apparent that the S&Es in FX are responsible for the significant overall drop in division F1 scores. The reason for this drop cannot be explained with the data available to the researcher. It is very doubtful that OD could have affected this dimension in such a negative way for a control group, especially since S&Es in the other control group actually had a small rise in average score from 1978 to 1979.

While FE had no significant gains in F1 scores, it had no significant losses either. It is possible that some of the upward change in scores for FE from 1978 to 1979 would reach

statistical significance if sustained through another measurement. Again, though, managerial personnel in FE did not exhibit significant positive change on this factor, a result that argues against the relationship observed by Porras and Berg [1978]. Overall then, the results are inconclusive. While the two control divisions had hierarchical groups which experienced a significant decline in scores on this criterion, the treatment division did not. On the other hand, no groups from FE or FG scored significantly higher than both of the groups from the control divisions.

Employee/Supervisor Interaction. The ANOVA results for F2 are provided in Table G-4, Appendix G. None of these tests reached statistical significance, duplicating the results of the homogeneous groups on this factor.

Table XXXIII contains the results of longitudinal change. As indicated, none of the changes reached statistical significance.

Discussion. From these data it appears that the OD program has had little impact on this criterion. Groups in FE did not achieve any significant gains on this factor, nor did FE or FG groups score higher than groups from the control divisions. These results essentially duplicate the findings discussed under homogeneous groups. In addition, supervisory personnel did not experience any greater rate of change than did other personnel in FE.

Organizational Warmth. The ANOVA results for F3 are

Table XXXIII
Longitudinal Change for Hierarchical Groups:
Employee/Supervisor Interaction#

Group	Name	Means: 1979-1978 (t-value)*		
		FX	FB	FE
1	Secretaries	.30 (.74)	-.24 (-.57)	-.39 (-.86)
2	Technicians	-.50 (-1.11)	.02 (.08)	.17 (.57)
3	S&Es	.02 (.10)	.21 (1.18)	-.09 (.57)
4	Group Leaders	.16 (.37)	.34 (.99)	.06 (.13)
5	Branch Chiefs	-.97 (-1.56)	-.66 (-1.16)	-.25 (-.66)
*None of the changes are statistically significant # n's for these tests are provided in Table G-4				

included in Table G-5, Appendix G. Only one test was close to reaching statistical significance: the 1979 test for Secretaries ($p=.059$). Secretaries in FG scored lower than secretaries in any other division. The finding reported under homogeneous groups for S&Es and Group Leaders is even more evident with hierarchical groups. These technical employees scored the lowest of all AFFDL positions on this factor. Since promotion-related items are a major part of this factor, the low scores for secretaries, S&Es, and Groups Leaders, all of which experience a promotion "stagnation" relatively early in their careers, may reflect dissatisfaction with Civil Service

promotion policies.

Table XXXIV provides the results of the tests of longitudinal change for the five groups. None of the changes were statistically significant.

Table XXXIV
Longitudinal Change for Hierarchical Groups:
Organizational Warmth: F3#

Group	Name	Means: 1979-1978 (t-value)*		
		FX	FB	FE
1	Secretaries	-.18 (-1.43)	.33 (.80)	-.20 (-.47)
2	Technicians	0 (0)	-.08 (-.33)	.29 (.73)
3	S&Es	-.14 (.73)	-.15 (-.89)	.03 (.12)
4	Group Leaders	-.13 (-.34)	.79 (1.85)	.17 (.37)
5	Branch Chiefs	-.45 (-.50)	.62 (1.50)	.07 (.11)
*None of the changes are statistically significant # n's for the tests are provided in Table G-5				

Discussion. Again, the impact of the OD program appears negligible. FE and FG employees did not score higher than their counterparts in the control divisions, nor did FE experience any positive change in F3 scores from 1978 to 1979. In fact, FE secretaries scored lower on this criterion than secretaries in any other division. This occurrence should be monitored if another measurement of AFFDL employees is taken.

Although Group Leaders and Branch Chiefs in FE showed some positive change in F3 scores over the one year between measurements, these changes were minor and not statistically significant. Again, the data fail to support the "intensity" hypothesis of Porras and Berg.

Organizational Communication. The ANOVA results for F4 are provided in Table G-6, Appendix G. One test was significant: the 1979 test for Group Leaders indicated that those in FX scored significantly lower than those in any other division. These results essentially parallel the results obtained with homogeneous groups.

The results of the tests of longitudinal change are contained in Table XXXV. Although only one test reached statisti-

Table XXXV
Longitudinal Change for Hierarchical Groups:
Organizational Communication: F4#

Group	Name	Means: 1979-1978 (t-value)		
		FX	FB	FE
1	Secretaries	-1.07 (-1.43)	-.32 (-.95)	.46 (.80)
2	Technicians	-.07 (-.17)	.04 (.15)	.47 (1.64)
3	S&Es	.13 (.75)	.16 (.90)	.56 (2.14)**
4	Group Leaders	-.36 (-.94)	.17 (.63)	.43 (1.45)
5	Branch Chiefs	-.43 (-1.58)	.47 (1.67)	.44 (.80)
**p=.05				

cal significance (a positive change for S&Es in FE), all groups in FE showed some improvement in F4 scores, and some of those changes were close to being statistically significant.

Discussion. These data confirm the interpretation derived from homogeneous groups. The high scores of both FE and FG on this factor, coupled with the significant longitudinal change for S&Es in FE suggest that OD has had a rather large positive impact on this factor of organizational climate.

Supervisory Support. The ANOVA results for F5 are contained in Table G-7, Appendix G. One test reached statistical significance: the 1978 measurement for Branch Chiefs indicated that those in FX scored significantly lower than those in either of the other two divisions. By the 1979 measurement, though, scores for Branch Chiefs in FX were enough higher that significant differences no longer existed among the divisions for this group.

The results of the tests of longitudinal change are contained in Table XXXVI. None of the changes were statistically significant.

Discussion. The data suggest that the team building intervention has had negligible effect on the amount of supervisory support perceived by AFFDL employees. As of the 1979 measurement, the data do not support any significant differences among the divisions on F5 scores, and neither FE or FG experienced any significant positive change on this factor.

Table XXXVI
Longitudinal Change for Hierarchical Groups:
Supervisory Support: F5#

Group	Name	Means: 1979-1978 (t-value)*		
		FX	FB	FE
1	Secretaries	.53 (.78)	.55 (1.64)	-.04 (-.06)
2	Technicians	-.27 (-.74)	-.26 (-.78)	-.11 (-.40)
3	S&Es	.03 (.15)	.04 (.22)	.01 (.04)
4	Group Leaders	.23 (.79)	.46 (.88)	-.15 (-.44)
5	Branch Chiefs	1.38 (3.13)	-.37 (-.52)	-.34 (-.83)
* None of these changes are statistically significant				
# n's for these tests are provided in Table G-7				

Divisional Differences: Absenteeism

As discussed in Chapter III, AFFDL maintains a manhour accounting system from which absenteeism rates by division can be calculated. Table XXXVII provides the results of a one-way ANOVA (using divisions as the "treatment") for both 1978 and 1979 data. The means provided are the four-month monthly averages of sick leave (total number of hours charged to sick leave divided by the total manhours available for that division in the particular month) for each division. The averages for each division were calculated over the same four month period,

Table XXXVII
Differences Among Divisions on Absenteeism

Measure	Mean and (Std Dev)						F-Value 1978 1979
	FX 1978	FX 1979	FB 1978	FB 1979	FE 1978	FE 1979	
Absenteeism	.0252 (.0039) n=4	.0320 (.0041) n=4	.0395 (.0075) n=4	.0337 (.0062) n=4	.0371 (.0027) n=4	.0280 (.0035) n=4	.0332 (.0076) n=4
							.0219 (.0043) n=4
							4.52* 4.96*
*p=.05							

Table XXXVIII
Longitudinal Change for Divisions:
Absenteeism

FX	FB	FE	FG
.0068 (2.42)	-.0058 (-1.19)	-.0091 (-4.14)**	-.0113 (-2.59)*
*p=.05	**p=.01		

October-January, in both 1977-1978 and 1978-1979.

Divisional Differences. As Table XXXVII indicates, there were significant differences among the divisions for both years. In 1978, FX had an absenteeism rate significantly below the divisional average. In 1979, the changes in the absenteeism rates of the divisions and the addition of FG (and its very low absenteeism rate to the ANOVA) accounted for the significance of the F-test.

Longitudinal Change. Table XXXVIII depicts the results of t-tests of longitudinal change on this measure. Both FE and FG had experienced significant drops on this measure. FB exhibited no significant change in its absenteeism rate, and FX's increased absenteeism rate almost reached statistical significance ($p=.06$).

Discussion. It is clearly tempting to conclude from these data that the OD intervention was responsible for the significant drops in the absenteeism rate for the treatment divisions. While such a conclusion could be reached on the basis of the data alone, the reader is cautioned that the quasi-experimental design used in this research cannot always control for one serious kind of experimental error: regression to the mean [Campbell and Stanley, 1963]. Given the lack of history on the absenteeism rates for the divisions (these data were unavailable), it is difficult to state with certainty that a truly significant change in absenteeism rates has occurred. It was noted, though, that FX was the division with the lowest

rate of absenteeism in the 1978 measurement, and both FE and FG had relatively high rates. The "switch" in positions for the 1979 measurement may have been significant, or it may have been regression toward the long term rate which has prevailed over many years.

The nature of the absenteeism measure itself also may introduce some ambiguity into these results. While Privacy Act limitations prevent substantiation of this statement, it is possible that a chronic illness (heart attack, stroke, etc.) occurring in a particular division could inflate divisional absenteeism rates. In examining the effect of such a situation, the 1978 data for FX was quickly analyzed by adding one through four months of additional total absence (160 manhours) to simulate the impact of a chronic illness for one person. The results are presented in Table XXXIX. These data indicate

Table XXXIX
Sensitivity Analysis of Absenteeism Rates to
Chronic Illness

	<u>Base Rate</u>	<u>+1 Month</u>	<u>+2 Months</u>	<u>+3 Months</u>	<u>+4 Months</u>
	.0252	.0261	.0270	.0279	.0289
	(5.02) FE	(4.63)	(4.25)	(3.88)	(3.46)
t-	(1.87) FG	(1.66)	(1.45)	(1.24)	(1.01)
value	(3.38) FB	(3.17)	(2.97)	(2.74)	(2.51)

that a chronic illness of one person (or more people for a shorter time) which requires an absence of up to three months

would have had little effect in this particular situation. Beyond a single three month absence, however, the figures may have changed enough to alter the statistical results. If such chronic illness cannot be assumed to be randomly distributed throughout the divisions, a bias could have been introduced which may have affected the results obtained in Tables XXXVII and XXXVIII.

Despite these caveats, though, there is a distinct possibility that the reduced absenteeism rates can be attributed to the OD program. Empirical research has consistently found that a fairly strong relationship exists between absenteeism and satisfaction [Porter and Steers, 1973]. And while individual absenteeism data is not available to correlate with Hoppock job satisfaction scores, it is noted that the Hoppock divisional mean for FE did indicate a slight rise in 1979, providing some theoretical justification for the significant drop in absenteeism over the same period. On the whole, however, a third measurement should be obtained to help confirm or deny the alternate hypotheses for the observed decline in absenteeism for the divisions participating in the OD program.

Multiple Discriminant Analysis

The last step in the analysis of the team building data was the investigation of multivariate differences among the four AFFDL divisions examined in this research. SPSS program DISCRIMINANT [Nie et al., 1975] was used in the stepwise mode to accomplish this task and to linearly combine the most dis-

criminating criterion variables in such a fashion that the resulting functions forced the divisions to be as statistically distinct as possible.

The results presented in the following paragraphs were obtained using a stepwise selection procedure for entering (or removing) criterion variables into the DISCRIMINANT program. Variables were selected on the basis of their capability to maximize the Mahalanobis distance between the two closest divisions. In order to include as many criterion variables as possible in the discriminant function, a F-value to enter or leave the process of 1.5 was specified.

Three measures of merit were used in analyzing the power of the resultant discriminant functions: the classificatory power of the related classification functions; the value of the canonical correlation associated with each discriminant function; and the significance level of the separate MANOVA analysis conducted on the DISCRIMINANT-identified variable vector. Each of these measures is explained in more detail in the following paragraphs.

The first measure of the power of the discriminant results is the capability of the derived classification function to assign a multivariate observation (one of the cases from the team development study) with "unknown" division membership to the proper division. Since actual division membership for each case is known, the classifying power of the functions can be calculated. In order not to upwardly bias the results, the

data base was randomly partitioned into two equal parts. One part was used to build the functions; the other part was then used to determine the classificatory capability. The percentage of respondents correctly classified provides a cross-validation of the discriminant analysis results.

An additional measure of merit is the canonical correlation associated with each discriminant function. The canonical correlation squared can be interpreted as the proportion of variance in the discriminant function explained by the divisions [Nie et al., 1975].

The final measure of the discriminating power of the identified variables in the discriminant function is obtained from the results of a one-way multivariate analysis of variance (MANOVA). The MANOVA provides a test of the null hypothesis that the centroids of the divisions (as defined by the discriminant variables) are equal. Small values of the Wilk's test statistic lead to rejection of the null hypothesis of no division centroid differences.

1978 Analysis. The 1978 data was analyzed in two ways:

1. For all respondents, using Hoppock, Patchen, and F1-F5 measures as possible discriminating variables.
2. For S&Es, Group Leaders, and Branch Chiefs, using the measures described above plus the three productivity measures (P1-P3) as candidate discriminant variables in the stepwise analysis.

Table XL provides the results of analysis number one.

Roman numerals II-IV correspond to the various measures of the power of the discriminant functions discussed in the introduction to this topic.

Table XL
Discriminant Analysis for 1978 Data
(excluding Productivity Measures)

I.	<u>Variable</u>	<u>Step Entered</u>	<u>Significance</u>	<u>Standardized Coefficient</u>
	F5	1	.083	1.06
II.	<u>Percent "Unknown" Observations Correctly Classified</u>			<u>Significance</u>
	43.3			.008
III.	<u>Function</u>	<u>Canonical Correlation</u>	<u>CC²</u>	<u>Significance</u>
	1	.15220	.023	.168
IV.	<u>Variable</u>	<u>Univariate Significance</u>		<u>Multivariate Significance</u>
	F5	.0016		same

As indicated, only one variable, F5, had a modicum of discriminatory capability for the 1978 sample. Although division membership explains just over two percent of the variance in the resulting discriminant function, the classificatory capability of F5 is quite good: 43.3 percent of the observations with "unknown" division membership were correctly classified. An examination of the classification table re-

sulting from the DISCRIMINANT printout revealed that the classification function did a very good job of correctly classifying cases from FB and FE, but it did a rather poor job of correctly classifying those from FX. Cases from FX were more likely to be classified as from one of the other divisions as from FX. Since only one variable entered the discriminant function, the univariate and multivariate statistics (part IV) were identical.

Table XLI provides the results of the 1978 analysis for S&Es, Group Leaders, and Branch Chiefs. Six variables were chosen for inclusion in the discriminant analysis. Two discriminant functions were formed, but only the first was statistically significant. Of the six variables in the discriminant function, the standardized coefficients reveal that Hoppock and Patchen were of the most importance in predicting division membership. As indicated, the classificatory power of the resulting classification function is rather poor, primarily because the functions fail to correctly classify members into FX. The MANOVA results, though, show that although five of the six variables in the function possess little univariate significance (the exception is P1, whose univariate significance is $p=.036$), the multivariate significance is $p=.0107$. This number is the significance level at which the null hypothesis of no difference between the three division's centroids (defined in terms of the six indicated criterion variables) can be rejected.

Table XLI
Discriminant Analysis for 1978 Data
(Including Productivity Measures)

I.	<u>Variable</u>	<u>Step Entered</u>	<u>Significance</u>	<u>Standardized Coefficient</u>
	PATCH	1	.131	1.13
	P1	2	.066	.24
	P2	3	.062	-.33
	F4	4	.047	-.42
	HOPP	5	.019	-.91
	F3	6	.008	.60

II.	<u>Percent "Unknown" Observations Correctly Classified</u>	<u>Significance</u>
	37.2	.422

III.	<u>Function</u>	<u>Canonical Correlation (CC)</u>	<u>CC²</u>	<u>Significance</u>
	1	.43837	.192	.008
	2	.28597	.082	.177

IV.	<u>Variable</u>	<u>Univariate Significance</u>	<u>Multivariate Significance</u>
	PATCH	.166	.0107
	P1	.036	
	P2	.106	
	F4	.502	
	HOPP	.178	
	F3	.389	

1979 Analysis. The 1979 analysis proceeded using the same methodology as 1978: separately examining all respond-

ents while excluding the productivity measures; then reaccomplishing the analysis for S&Es, Group Leaders, and Branch Chiefs while including the productivity measures.

The first 1979 discriminant analysis produced the results recorded in Table XLII. Only two variables exhibited any major

Table XLII
Discriminant Analysis for 1979 Data
(Excluding Productivity Variables)

I.	<u>Variable</u>	<u>Step Entered</u>	<u>Significance</u>	<u>Standardized Coefficient</u>
	F4	1	.270	.62
	F3	2	.130	.82

II.	<u>Percent "Unknown" Observations Correctly Classified</u>	<u>Significance</u>
	30.2	.101

III.	<u>Function</u>	<u>Canonical Correlation(CC)</u>	<u>CC²</u>	<u>Significance</u>
	1	.20635	.043	.130
	2	.09784	.010	.409

IV.	<u>Variable</u>	<u>Univariate Significance</u>	<u>Multivariate Significance</u>
	F4	.015	.0011
	F3	.010	

discriminating power in this analysis: F3 and F4. They were of roughly equal importance as their standardized co-

efficients indicate. The ability of these variables to properly classify "unknown" observations into the correct division was fairly poor. The MANOVA results, though, show that F3 and F4 define divisional centroids that allow the hypothesis of no differences among divisions to be rejected at a very low level ($p=.001$).

The second 1979 discriminant analysis produced the results summarized in Table XLIII. Three variables: P1, P3, and F1 were selected for inclusion in the discriminant functions. Of these, P3 was the most important followed by F1 and then P1. The classificatory capability of the resulting classification functions was very good: 40.4 percent of the "unknown" observations were correctly classified. The classification table results indicated that there was some difficulty, however, in differentiating FX from both FE and FG. The high significance of the MANOVA results, though ($p=.00001$), confirm that these three criterion variables define division centroids which make at least two of the four divisions quite distinct in a statistical sense.

Discussion. The results obtained with the discriminant analyses parallel much of the analysis previously described in the chapter. In 1978 the results show that only one non-productivity variable (F5) exhibited any substantial power to discriminate division membership among the employees of AFFDL. When the productive criterion measures were added as candidate discriminant variables, the resultant discriminant functions

Table XLIII
Discriminant Analysis for 1979 Data
(Including Productivity Measures)

I.	<u>Variable</u>	<u>Step Entered</u>	<u>Significance</u>	<u>Standardized Coefficient</u>
	P1	1	.061	-.30
	P3	2	.007	1.21
	F1	3	.002	.59

II.	<u>Percent "Unknown" Observations Correctly Classified</u>	<u>Significance</u>
	40.4	.000

III.	<u>Function</u>	<u>Canonical Correlation (CC)</u>	<u>CC²</u>	<u>Significance</u>
	1	.37361	.140	.002
	2	.25441	.065	.081
	3	.07073	.005	.447

IV	<u>Variable</u>	<u>Univariate Significance</u>	<u>Multivariate Significance</u>
	P1	.375	.00001
	P3	.0001	
	F1	.015	

for S&Es, Group Leaders, and Branch Chiefs did a better job of separating at least two of the division centroids ($p=.01$).

The 1979 analyses suggest that discriminating among the divisions on the basis of multivariate observations had become a little easier. Two non-productivity variables, F3

and F4 (Organizational Warmth and Organizational Communication) defined a vector which significantly ($p=.001$) separated at least two of the divisions. For S&Es, Group Leaders, and Branch Chiefs, the results were even more striking. A vector defined by two productivity measures (P1 and P3) and an organizational climate factor (F1) produced MANOVA results significant at a $p=.00001$ level. Unfortunately, this latter analysis includes a productivity variable, P3, for which the univariate ANOVA produced results significant at a level of $p=.00006$. The reader may recall that the very low scores of FG personnel on P3 were the main cause for this result. It is unfortunate from the standpoint that personnel from FG were not surveyed in 1978, so it is impossible to measure what change had occurred on P3 over the past year. Consequently, ambiguity surrounds the interpretation of these particular results.

Summary of Results

The purpose of this section is to summarize the results of this chapter while examining the hypotheses presented in Chapter I.

Primary Hypothesis. The primary hypothesis of this thesis is repeated from Chapter I:

Divisions which are involved in the team development effort showed more positive change on criterion variables than divisions which are not involved in the OD program.

The results suggest that this hypothesis is supported with some qualification. Of the eleven criterion variables

used in this analysis of organizational change, significant positive change occurred on only two: an organizational climate factor representing an employee's perception of the quality of communications flow within AFFDL, and an absenteeism measure associated with divisional rates of sick leave. In both cases one or both of the OD-exposed divisions experienced positive change. On the negative side, one of the control divisions suffered a significant drop on another of the organizational climate factors: feelings toward an employee's immediate work group. On the eight remaining criterion variables none of the divisions displayed any significant change from 1978 to 1979. These data seem to suggest, therefore, that the OD program has had a modest, but positive effect, on the participating divisions.

Support for the hypothesis cannot be made without some qualification, however. A possibility of alternate causes for the significant drop in absenteeism prevents unqualified attribution of this observed effect to the OD intervention. In addition, the productivity data point up some potentially disturbing trends in the output of the OD divisions relative to the control divisions. Of the three productivity factors, FG scored significantly lower ($p=.0001$) than the divisional mean on one factor, and both PhDs and S&Es in grades GS-12 and below in FG scored significantly lower than the divisional mean on another. Although ambiguous because of the absence of a 1978 measurement for FG, this situation warrants further examina-

tion. Furthermore, while not quite reaching statistical significance at the $p=.05$ level (two-tailed), FE suffered substantial declines on all three productivity factors from 1978 to 1979. In the aggregate these results may be an early indicator of a negative productivity trend in FE and FG which would reach statistical significance if sustained over a two year period. Another measurement is required, though, to either confirm or deny that a significant negative trend exists, or else to reveal that the results derived from the 1979 measurement were just a product of coincidental sampling error.

Secondary Hypothesis. The secondary hypothesis of this research emanated directly from the organizational change model (originally proposed by Likert) used in this study:

Intervening variables (primarily those associated with organizational climate) exhibited less positive change than end-result variables (productivity and absenteeism).

The data do not tend to support this hypothesis. As previously mentioned, one organizational climate factor exhibited significant change for FE, while no positive change was found in the productivity factors. Significant positive change did occur in absenteeism (a lower absenteeism rate) for FE and FG, but the existence of some ambiguity surrounding the causal factor for this change prevents unqualified attribution of the observed effect to the OD program.

The reader may recall that this hypothesis was developed because OD had been underway in AFFDL for over three years at

the time of the second measurement. Using Likert's model, it seemed reasonable to expect that any OD-induced organizational change would have progressed through the causal-intervening-end result sequence to the point where intervening variables would have begun to cease changing and the main effect would be observed in the end-result variables. The fact that the data do not support this view may have profound implications for Likert's model, the nature of the specific OD program at AFFDL, or both. Discussion of these issues and recommendations for further study are presented in the concluding chapter.

V Discussion and Conclusions

Introduction

In reviewing previous studies on the effectiveness of OD interventions in Chapter II, it was noted that many problems plague researchers in this area. The particular research effort attempted to avoid or minimize as many of the research problems as possible, and to a certain degree it was successful in this attempt. The quasi-experimental design of the research controlled for most of the sources of experimental error, and statistical control was applied to all the quantitative analysis. However, despite these controls the answer to the question concerning the overall effectiveness of the OD program in AFFDL is equivocal. While OD appears to be responsible for a significant positive change in the openness and communication dimension of organizational climate, its impact on the other criterion variables was negligible with two exceptions:

1. Absenteeism underwent significant decreases in both OD divisions, and either stayed the same or went up in the control divisions.
2. The OD divisions scored either significantly lower than the other divisions on the productivity measures (FG), or exhibited substantial negative longitudinal change on these factors (FE) which could result in a significant drop in productivity is sustained over another measurement.

These two findings are somewhat contradictory and therefore puzzling. A reconciliation of these findings and a discussion of the current state of the OD program in AFFDL is the topic of the next section.

The OD Program in AFFDL

The positive change in the perceived quality of organizational communication in FE is consistent with the goals of team building interventions. Since S&Es were responsible for much of the increase on this factor, it is clear that FE managers have been successful in increasing the openness of the division so that even the most isolated group, S&Es, perceived a significantly improved communications climate. The scores of FG personnel on this factor also indicate that OD has been successful in this division too. It is somewhat surprising, though, that this factor is still showing positive change three years after the inception of the OD program. The creation of a climate of openness, trust, and increased interpersonal communication is usually an initial goal of a team building intervention [McGill, 1977]; to observe significant change in this factor at such a late date suggests that the organizational changes brought about by the OD program are not in as late a stage as might be expected. There are several possible reasons for this that have profound implications for the OD program at AFFDL.

Intervention Intensity. As mentioned in Chapter I, Dr.

Lehner (the external change agent) visits the laboratory approximately eight times a year for two-day sessions. These sessions are rather informal, voluntary, and sometimes less than well-publicized. While such a low-key approach to OD is somewhat unusual, it is consistent with the generally relaxed nature of interpersonal interventions, and it parallels other OD programs conducted at Wright-Patterson Air Force Base [Westover, 1975; Trask, 1973]. What separates the OD effort at AFFDL from those at other organizations on the base (AFML and AFAPL) is that AFFDL has no internal OD facilitator to work with the divisions during Dr. Lehner's absences. The lack of an internal facilitator has two major effects on the OD program in AFFDL:

1. The present program lacks continuity. Interest in and involvement with OD activities appear to peak during the time the external change agent is present. During his absences there is no designated AFFDL focal point to assist groups with their problems, monitor progress, or plan future activities. These are tasks normally accomplished by an internal change agent, and these people have often been credited with large portions of the apparent success of some OD programs [Franklin, 1976; French and Bell, 1973; Browne, 1973]. The failure of AFFDL to designate such a position casts some doubt on the extent of top-level support for the program which so many OD theorists insist is a crucial (some say the crucial) element in the long term success of any OD intervention [French and Bell, 1978; Bennis, 1969].

2. The OD program lacks visibility. Incredible as it may seem, unsolicited comments on several returned surveys indicated that the respondents were unaware that a laboratory team development program even existed:

I have no knowledge of a laboratory team development program [Group Leader in FX; 3-5 years in AFFDL].

What team development program? [Technician in FB; 6-10 years in AFFDL].

In 1977, shortly after the program began at the laboratory, a survey indicated that only 21 percent of the respondents were aware of the team development program [Corbin, 1977]. While that percentage has undoubtedly improved over the intervening two years, it is indicative of the low-key emphasis on the OD program that even long-term employees are unaware of its existence. Even those who are aware, though, argue that the program needs more emphasis in order to be effective. As one S&E wrote:

Actual realization of team development concepts probably requires that [OD] be given some visibility in the required documentation for work units, tasks, and support system projects. For example, it is quite common to see functional diagrams showing the interrelationships among the components in various hardware and software systems. Although there is a high degree of interdependence among personnel functions, one never sees a block diagram showing the inputs and outputs of various individuals in achieving the objectives of the team [GS-13].

Organizational Change. The nature and conduct of this particular OD program may well be responsible for the puzzling results observed in this research. It is possible, given the

rather shallow intensity of this intervention, that OD is operating in "slow motion" in AFFDL. This would explain why what is normally an initial team building goal, improved group communication, showed positive change in this research, over three years after the program began. OD-induced organizational change may be just beginning in the OD divisions. If this is the case, it would be unreasonable to expect positive changes in productivity factors which represent end-result variables. As Likert observed, the time lag from translating improvement in intervening variables to end-result variables can often take over a year [1967]. Likert's observations, moreover, were based on interventions of considerable intensity, often involving several external change agents, and the services of a considerable OD staff team. The time lag would undoubtedly be longer in a less intense organizational change effort.

Still unaccounted for, though, are the significant decreases in absenteeism for FE and FG. These decreases may be coincidental, due more to a fortuitous absence of chronic illness (see Chapter IV) than any OD-induced effect. Absenteeism is classified by Likert as an end-result variable; if absenteeism decreased in these divisions as a result of OD activities, a similar positive effect in productivity should also have appeared. On the other hand, the productivity measures used in this analysis have some considerable inherent lag time due to the fact that they measure activities (papers published, presentations made, etc.) over the past year. Again,

this is an area where another measurement would assist in resolving the issues.

General. The results of this evaluation indicate that the OD program at AFFDL has not yet achieved all of its goals. It has been successful in increasing the openness and communication perceived by the members of the OD divisions, but a similar positive effect on other organizational climate dimensions, job satisfaction, or job motivation has not yet appeared. The nature of AFFDL's particular OD intervention, though, suggests that the process of OD-induced change may still be occurring within the laboratory. Future measurements could reveal positive changes across a wider spectrum of intervening and end-result variables.

The OD program at AFFDL can only be termed modest by any measure: scope, investment, or participation. A finding that the returns from the program are commensurate with its low profile is not surprising. In fact, if the observed reduction in absenteeism turns out to be attributable to the OD program, the cost of Dr. Lehner's services will have been repaid many times over. The process of organizational change might be hastened, however, by providing the team building program with greater organizational commitment. The appointment of a full-time internal OD facilitator would be an important step in demonstrating this commitment and elevating the status and intensity of OD actions within the laboratory.

S&Es as a group should be special targets for future OD

AD-A076 979

AIR FORCE INST OF TECH WRIGHT-PATTERSON AFB OH SCH00--ETC F/G 5/1
AN ASSESSMENT OF TEAM DEVELOPMENT AT THE AIR FORCE FLIGHT DYNAM--ETC(U)

UNCLASSIFIED

SEP 79 R G DEKOK
AFIT/GSM/SM/79-S-3

NL

3 OF 3
AD-A
076979



END
DATE
FILMED
-5-80
NTIS

activities. Of the seven measures of organizational climate, job satisfaction, and job motivation used in this study, S&Es scored the lowest of any group on four of the measures and next to the lowest on another. Of course, much of the reason for the low scores of S&Es may be structural in nature. Promotion-related items in particular appear to be a serious source of discontent for S&Es, and it is not clear what impact OD could hope to have on the Civil Service or Military promotion system. In fact, some authors note that the recognition of structural limits on OD interventions is essential in defining successful OD programs [Rice, 1977]. Yet there is doubt that S&Es can be assisted in their discontent without some major structural changes. Perhaps the best illustration of this point is made in the unsolicited comments of two S&Es:

The climate in the laboratory is poor. Many younger, highly qualified people have either left or are seeking to leave. We spend too much time following exercises, filling out forms, and reviewing our work. Little is done to help or encourage the S&E to do a good technical job. [GS-13 in FG].

The numbers of inane exercises have been increasing. Morale is down; higher level management decisions and lack of action seems to be responsible for this. Management does not seem to be looking out for the personnel. If the situation does not improve, I will probably join the exodus from the lab. [PhD in FB].

Recommendations for Further Research

The recommendations which follow are derived from either shortcomings in the present research effort, or are future actions which might assist in resolving ambiguities associated

with the data analysis effort.

Researchers are urged to continue to evaluate the effectiveness of OD interventions. OD, if it is to endure, must become subject to critical inquiry into its effectiveness. OD programs can be evaluated, and their evaluation can be assisted by the early formulation of explicit goals and objectives agreed to by both the practitioner and the client organization. As an important part of the overall evaluation effort, a pre-OD baseline measurement of the client organization should be made using a multivariate criteria measure based on the goals of the specific OD intervention. Such baseline measures remove much of the uncertainty associated with the interpretation of organizational change. In addition, voluntary OD programs should be accompanied by an assessment item which measures the extent of an individual's participation in the OD program. Data from this type of measure can be used directly to ascertain the effect of intervention intensity on program success.

Finally, if survey methods are used to obtain baseline and subsequent measurements, respondents should be encouraged to comment on any items they feel warrant an expanded response. Some of the best insight into the processes and attitudes of the organization can be obtained by these comments.

Although sometimes difficult to implement in practice, a rigorous quasi-experimental research design [Campbell and Stanley, 1963] should be used to eliminate alternative hypotheses for any observed change. This usually implies both longi-

tudinal analysis and the use of control groups. Based on the results of this study, researchers should be prepared to continue their evaluations for extended periods of time. While most OD interventions could be expected to produce measurable results within a year or so after program inception, interventions of lower intensity might extend this time substantially.

As far as the evaluation of the OD effort in AFFDL is concerned, follow-up research should be conducted with the following objectives:

1. Confirm or deny that the process of OD-induced organizational change is still occurring within the laboratory.
2. Observe if more of the perceptual measures exhibit statistically significant change over a two year period.
3. Resolve the absenteeism issue for FE and FG. Confirm or deny that this is an effect that can be unequivocally attributed to the OD program.
4. Observe if the fall in the scores of FX employees on the immediate work group dimension of organizational climate is a continuing event, and ascertain its probable causes.
5. Resolve the productivity issues for FE and FG. Investigate whether productivity is a static or cyclical variable within AFFDL, and if cyclical, determine its period.

Bibliography

- Adams, John D. "Professional Development: Some Implications for the Practice of OD," OD Practitioner 6 no. 2:7-8, Summer 1974.
- , "IAASS Expands: New Scope and Directions," OD Practitioner 7 no. 2:8, July 1975.
- AFFDL Brochure, "Flight Vehicle Technology for Aerospace Systems," (Ninth Edition), 1976.
- Argyris, Chris. Intervention Theory and Method: A Behavioral Science View. Reading, MA: Addison-Wesley, 1970.
- , Management and Organization Development: The Path from XA to YB. New York: McGraw-Hill, 1971.
- Armenakis, Achilles A., Hubert S. Field, and William H. Holley. "Guidelines for Overcoming Empirically Identified Evaluation Problems of Organizational Change Agents," Human Relations 29 no. 12:1147-61, 1976.
- Beckhard, Richard. Organization Development: Strategies and Models. Reading MA: Addison-Wesley, 1969.
- , "Optimizing Team-Building Efforts," Journal of Contemporary Business, pp. 23-32, Summer 1972.
- and Reuben T. Harris. Organization Transitions: Managing Complex Change. Reading, MA: Addison-Wesley, 1977.
- Beer, Michael. "The Technology of Organization Development," in M. Dunnette (Ed.) Handbook of Industrial and Organizational Psychology, Chicago: Rand-McNally, 1976.
- Bennis, Warren G. Organizational Development: Its Nature, Origin and Prospects, Reading MA: Addison-Wesley, 1969.
- Bowen, Donald D. "Value Dilemmas in Organization Development," Journal of Applied Behavioral Science 13 no. 4: 543-56, 1977.
- and Raghu Nath. "TA in OD: Applications with the NTL Model," Academy of Management Review 3:79-89 (Jan 78)
- Bowers, David G. "OD Techniques and their Results in 23

- Organizations: The Michigan ICL Study," Journal of Applied Behavioral Science 9 no.1:21-43, 1973.
- , "Organizational Development: Promises, Performance, Possibilities," Organizational Dynamics 4:50-64, 1976.
- , Jerome L. Franklin, and Patricia A. Pecorella, "Matching Problems, Precursors, and Interventions in OD: A Systematic Approach," Journal of Applied Behavioral Science 11 no.4:391-409, 1975.
- Browne, Phillip J. and Chester C. Cotton. "Who are We? A Profile of Internal OD Practitioners," OD Practitioner 5 no.3:7, Winter 1973.
- , et al. "Marginality and the OD Practitioner," Journal of Applied Behavioral Science 13 no.4:493-506, 1977.
- Burke, W. Warner and Warren H. Schmidt. "Management and Organizational Development: What is the Target of Change?," Personnel Administration (Mar-Apr 1971): 44-57.
- Cahn, M.M. "Helping People with their Differences--an OD Direction," Interview with Stuart Atkins, Journal of Applied Behavioral Science 13 no.1:110-116, 1977.
- , "OD and Productivity: An Interview with John H. Zenger," Journal of Applied Behavioral Science 14 no.1:99-111, 1978.
- Campbell, Donald T. and Julian C. Stanley. Experimental and Quasi-Experimental Designs for Research. Chicago: Rand-McNally, 1963.
- Connor, Patrick E. "Critical Inquiry into Some Assumptions and Values Characterizing OD," Academy of Management Review 2:635-44, Oct 1977.
- Corbin, Larry J. "Productivity and Job Satisfaction in Research and Development: Associated Individual and Supervisory Variables," Unpublished Master's Thesis, Air Force Institute of Technology, School of Engineering, Wright-Patterson Air Force Base, Ohio, 1977.
- Crockett, William J. "Team Building: One Approach to Organization Development," Journal of Applied Behavioral Science 6 no.3:291-306, 1970.
- Cronbach, L.J. and P.E. Meehl. "Construct Validity in Psychological Tests," Psychological Bulletin 52:281-302, 1955.

- Cummings, Thomas G., Edward S. Malloy and Roy Glen. "A Methodological Critique of 58 Selected Work Experiments," Human Relations 30 no.8:675-708, 1977.
- Downey, H.K., D. Hellriegel and J.W. Slocum. "Congruence between Individual Needs, Organizational Climate, Job Satisfaction, and Performance," Academy of Management Journal 18:149-55, 1975.
- Fordyce, Jack K. and Raymond Weil. "Methods for Finding Out What is Going On," Managing with People. Reading MA: Addison-Wesley, 1971; in French, Bell, and Zawacki, 1978: 121-129.
- Forehand, G.A. and B. Gilmer. "Environmental Variation in Studies of Organizational Behavior," Psychological Bulletin 62:361-382, 1964.
- Franklin, Jerome L. "Characteristics of Successful and Unsuccessful OD," Journal of Applied Behavioral Science 12:471-92, 1976.
- French, Wendell L. "Organization Development Objectives, Assumptions, and Strategies," California Management Review 12 no.2:23-34, 1969.
- and Cecil H. Bell. Organization Development (1st ed.) Englewood Cliffs, New Jersey: Prentice-Hall, 1973.
- , Organization Development (2nd ed.) Englewood Cliffs, New Jersey: Prentice-Hall, 1978.
- and Robert A. Zawacki. Organization Development: Theory Practice, and Research, Dallas: Business Publications, 1978.
- Friedlander, Frank. "OD Reaches Adolescence: An Exploration of its Underlying Values," Journal of Applied Behavioral Science 12:7-21, 1976.
- and L.D. Brown. "Organization Development," Annual Review of Psychology 25:313-41, 1974.
- and N. Margulies. "Multiple Impacts of Organizational Climate and Individual Value Systems Upon Job Satisfaction," Personnel Psychology 22:171-183, 1969.
- Ganesh, R. "Organizational Consultants: A Comparison of Styles," Human Relations 31:1-28, 1978.
- Gluckstern, N.B. and R.W. Packard. "Internal-External Change Agent Team: Bringing Change to a Closed Institution,"

- Journal of Applied Behavioral Science 13 no.1:41-52, 1977.
- Gooch, L.L. "Policy Capturing with Local Models: The Application of the AID Technique in Modeling Judgement," Unpublished Doctoral Dissertation; University of Texas, December 1972.
- Goodman, Roger J. "Public Personnel Administration Requires an OD Effort," Public Personnel Management 7: 192-7, 1978.
- Hand, Herbert H., Bernard D. Estafen, and Henry P. Sims, Jr. "How Effective is Data Survey and Feedback as a Technique of Organization Development?" Journal of Applied Behavioral Science 11:333-347, 1975.
- Hertzberg, F., B. Mausner, R.O. Peterson and D.F. Clapwell. Job Attitudes: Review of Research and Opinion, Pittsburg: Psychological Service of Pittsburg, 1957.
- Hogan, Daniel B. "The Advantages of Accreditation Through IAASS," Group and Organization Studies 1 no.4:394-97, 1976.
- Hoppock, Robert. Job Satisfaction. New York: Harper and Row, 1935.
- Hulin, C.L. and P.C. Smith. "A Linear Model of Job Satisfaction," Journal of Applied Psychology 49:209-216, 1965.
- Hunt, J.W. and P.N. Saul. "The Relationship of Age, Tenure, and Job Satisfaction in Males and Females," Academy of Management Journal 18:690-702, 1975.
- Johannesson, R.E. "Some Problems in the Measurement of Organizational Climate," Organizational Behavior and Human Performance 10:118-44, 1973.
- Jones, John E. "The Disadvantages of Accreditation through IAASS," Group and Organization Studies 2 no.1:5-8, 1977.
- , and J. William Pfeiffer. "Commentary," Group and Organization Studies 2 no.3:263-4, 1977.
- Kahn, Robert L. "Organization Development: Some Problems and Proposals," Journal of Applied Behavioral Science 10: 485-502, 1974.
- Kilmann, Ralph H. and Richard P. Herden. "Towards a Systematic Methodology for Evaluating the Impact of Interventions on Organizational Effectiveness," Academy of Management Review 1 no.3:87-98, 1976.

- Kochan, T.A. and L. Dyer. "A Model of Organizational Change in the Context of Union-Management Relations," Journal of Applied Behavioral Science 12 no.1:59-78, 1976.
- Kolb, D.A. and A.L. Frohman. "An Organization Development Approach to Consulting," Sloan Management Review, 12: 51-65, 1970.
- Kolb, D.A. and R.E. Boyatzis. "On the Dynamics of the Helping Relationship," in D.A. Kolb, I.M. Rubin, and J.M. McIntyre (Eds.) Organizational Psychology. Englewood Cliffs, New Jersey: Prentice-Hall, 1974.
- Kotter, John P. and Leonard A. Schlesinger. "Choosing Strategies for Change," Harvard Business Review Mar-Apr 1979: 106-114.
- LaFollette, W.R. and H.P. Sims. "Is Satisfaction Redundant with Organizational Climate?," Organizational Behavior and Human Performance 13:257-78, 1975.
- Langford, William D. "Organizational Development: Environmental Pressures, the Military Setting, and the Ultimate Test," Unpublished Master's Thesis, Naval Postgraduate School, Monterey, CA, June 1978 (AD-A057-908).
- Leach, John. "Career Development Study as an OD Intervention," Training and Development Journal 32:34-38, 1978.
- Lieberman, M.A., I.D. Yalon, and M.B. Miles. Encounter Groups: First Facts. New York: Basic Books, 1973.
- Likert, Renis. The Human Organization. New York: McGraw-Hill, 1967.
- Lindell, Michael K. and John A. Drexler, Jr. "Issues in Using Survey Methods for Measuring Organizational Change," Academy of Management Review 4 no.1:13-19, 1979.
- Lippit, Gordon L. "Developing Life Plans: A New Concept and Design for Training and Development," Training and Development Journal 24:2-7, 1970.
- Lippit, Ronald, Jeanne Watson and Bruce Westley. The Dynamics of Planned Change. New York: Harcourt, Brace, and World, Inc., 1958.
- Litwin, G.H. and R.A. Stringer. Motivation and Organizational Climate. Boston: Harvard University, 1968.

Manley, T. Roger and Charles W. McNichols. "OD at a Major Government Research Laboratory," Public Personnel Management 6:51-60, 1977.

McClelland, David C. "A Competency Model for Human Resource Management Specialists to be Used in the Delivery of the Human Resource Management Cycle," Unpublished document prepared for the U.S. Navy, June 19, 1975 by McBer and Company, Boston, MA.

----- and D. Winter. Motivating Economic Achievement. New York: Free Press, 1969.

McClelland, David C., J.W. Atkinson, R.A. Clark and E.L. Lowell. The Achievement Motive. New York: Appelton-Century Crofts, 1953.

McGill, Michael E. Organization Development for Operating Managers. New York: AMACOM, 1977.

McGregor, Douglas. The Human Side of Enterprise. New York: McGraw-Hill, 1960.

----- The Professional Manager. New York: McGraw-Hill, 1967.

McNichols, Charles W., Michael J. Stahl and T. Roger Manley. "A Validation of Hoppock's Job Satisfaction Measure," Academy of Management Journal, Dec 1978:737-742.

Meyer, H.H. "Achievement Motivation and Industrial Climates," in R. Taiuri and G.H. Litwin (Eds.) Organizational Climate: Explorations of a Concept. Boston: Harvard University, 1968.

Miles, Matthew B. and Richard A. Schmuck (Eds.) Organization Development in Schools. La Jolla, CA: University Associates, 1976; in French, Bell and Zawacki, 1978.

Mitchell, Michael D. and James A. Carney. "Accreditation for Internal OD Practitioners?," OD Practitioner 6 no.4: 1-4, 1974.

Morrison, Peggy. "Evaluation in OD: A Review and an Assessment," Group and Organization Studies 3 no.1:42-70, 1978.

Nadler, David A. Feedback and Organizational Development: Using Data-Based Methods. Reading MA: Addison-Wesley, 1977.

Nie, N.H., C.H. Hull, J.G. Jenkins, K. Steinbrenner, and D.H. Bent. Statistical Package for the Social Sciences.

- (2nd Ed.) New York: McGraw-Hill, 1975.
- Patchen, Martin. "Some Questionnaire Measures of Employee Motivation and Morale," Ann Arbor: Institute for Social Research Monograph 41, 1965.
- , Participation, Achievement, and Involvement on the Job. Englewood Cliffs, New Jersey: Prentice-Hall, 1970.
- Pate, Larry E., Warren R. Nielson and Paula C. Bacon. "Advances in Research on Organization Development: Toward a Beginning," Group and Organizational Studies 2 no.4:449-460, 1977.
- Patten, Thomas H. Jr. and Lester E. Dorey. "Long-Range Results of a Team Building OD Effort," Public Personnel Management 6:31-50, 1977.
- Payne, R.L. and D.C. Pheysey. "G.G. Stern's Organizational Climate Index: A Reconceptualization and Application to Business Organizations," Organizational Behavior and Human Performance 6:77-98, 1971.
- Pfeiffer, J. William. "Perspectives," Group and Organization Studies 1(4):393, 1976.
- Porras, Jerry I. and P.O. Berg. "The Impact of Organization Development," Academy of Management Review 3 no.2:249-266, 1978.
- , "Evaluation Methodology in Organization Development: An Analysis and Critique," Journal of Applied Behavioral Science 14 no.2:151-173, 1978.
- Porter, Lyman W. and R.M. Steers. "Organizational, Work, and Personal Factors in Employee Turnover and Absenteeism," Psychological Bulletin 80:151-176, 1973.
- Porter, Lyman W., Edward E. Lawler III and J. Richard Hackman. Behavior in Organizations. New York: McGraw-Hill, 1975.
- Prakash, Sutikshan. "Some Characteristics of an Effective Organization Development Agent," OD Practitioner 1:1-6, 1968.
- Quinn, Robert E. "Towards a Theory of Changing: A Means-Ends Model of the Improvement Process," Human Relations 31:395-416, 1978.
- Rice, George H. Jr. "Structural Limits on Organization Development," Human Resource Management 16:9-13, 1977.
- Ronen, Simcha. "Job Satisfaction and the Neglected Variable Of Job Seniority," Human Relations 31 no.4:297-308, 1978.

- Schein, Edgar H. "The Individual, the Organization, and the Career: A Conceptual Scheme," Journal of Applied Behavioral Science 7:401-426, 1971.
- Schneider, Benjamin. "Conceptualizing Organizational Climate," Research Report Number 7, Prepared for U.S. Navy; Contract No. N00014-67-A-0239-0025, Office of Naval Research, May 1974 (AD-783 064).
- and C.J. Bartlett. "Individual Differences and Organizational Climate: The Research Plan and Questionnaire Development," Personnel Psychology 21:323-333, 1968.
- Shepard, Herbert A. "Rules of Thumb for Change Agents," OD Practitioner 7 no.3:1-5, 1975.
- Smith, P.C., L.M. Kendall and C.L. Hulin. The Measurement of Satisfaction in Work and Retirement. Chicago: Rand-McNally, 1964.
- Spencer, Lyle M. and Bernard J. Cullen. "Taxonomies of Organizational Change: Literature Review and Analysis," McBer and Co. Report prepared for the U.S. Army Research Institute, September 1978 (AD-A064 486).
- Stahl, Michael J., Charles W. McNichols and T. Roger Manley. "An Assessment of Team Development at the Air Force Flight Dynamics Laboratory: Research Design and Baseline Measurement," Technical Report, TR-78-3 (1978), Air Force Institute of Technology, School of Engineering, Wright-Patterson Air Force Base, Ohio.
- Stahl, Michael J. "Innovation and Productivity in Research and Development: Some Associated Individual and Organizational Variables," Technical Report TR-76-10 (1976), Air Force Institute of Technology, School of Engineering, Wright-Patterson Air Force Base, Ohio.
- Stein, R. Timothy. "Accuracy of Process Consultants and Untrained Observers in Perceiving Emergent Leadership," Journal of Applied Psychology 62 no.6:755-59, 1977.
- Stevens, A.E. "Rewards for Air Force Research and Development Scientists/Engineers," Unpublished Master's Thesis, Air Force Institute of Technology, School of Engineering, Wright-Patterson Air Force Base, Ohio, 1976.
- Tannenbaum, Robert. "OD and its Practitioners: History, Issues, Speculations, Concerns, and Hopes," OD Practitioner 8 no.3:1-5,16, 1976.

- Tichy, Noel M. and Jay N. Nisberg. "Change Agent Bias: What They View Determines What They Do," Group and Organization Studies 1 no.3:286-301, 1976.
- Trask, Tommy J. "An Evaluation of Organizational Development As Applied to the AF Materials Laboratory," Unpublished Master's Thesis, Air Force Institute of Technology, School of Engineering, Wright-Patterson Air Force Base, Ohio, Dec 1973 (AD-773 038).
- Truax, C.B. and R.R. Carkhuff. Toward Effective Counseling and Psychotherapy. Chicago: Aldine, 1966.
- Umstot, Denis D. "Organization Development Technology and the Military: A Surprising Merger," In Press.
- Varney, Glenn H. "Training Organization Development Practitioners: A Need for Clarity of Direction," Exchange: The Organizational Behavior Teaching Journal III no.4: 3-7, 1978.
- Warrick, D.D. "Applying OD to the Public Sector," Public Personnel Management 5:186-90, 1976.
- Westover, Timothy O. "An Evaluation of the Organizational Environment of the Air Force Materials Laboratory," Unpublished Master's Thesis, Air Force Institute of Technology, School of Engineering, Wright-Patterson Air Force Base, Ohio, September 1975.
- White, Sam E. and Terrance R. Mitchell. "Organization Development: A Review of Research Content and Research Design," Academy of Management Review 1 no.2:57-73, 1976.
- Woodman, Richard W. and Donald C. King. "Organizational Climate: Science or Folklore?," Academy of Management Review 3 no.4:816-826, 1978.

Appendix A

Survey Instruments

DEPARTMENT OF THE AIR FORCE
AIR FORCE FLIGHT DYNAMICS LABORATORY
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433



Office of the Commander

21 DEC 1977

SUBJECT: AFFDL Survey on Effectiveness of Team Development Program
(JON - 99919961)

TO: Laboratory Personnel in FB, FE & FX

1. For over two years AFFDL has conducted selected team development programs utilizing the services of Dr George Lehner. These have included Corporate Board sessions, some division and branch training, work with the Branch Chief's Council and the Women's Seminar. We have received some very favorable comments about this training. In 1978, additional programs are planned.
2. This is an opportune time to make an assessment of the effectiveness of the current program and approach. I have requested that AFIT make some measurements on our perceptions about our organization. Divisions that have had team development sessions and those that have not will be questioned to determine if there is a difference. Therefore, after further training, more measurements will be taken to see if there have been changes. The data will be used as an important input to decisions to continue, change or terminate our present approach.
3. The measures will be based on a questionnaire that takes about 15 minutes to complete. Participation is voluntary but your opinions are really needed to provide a valid statistical survey. Your name is not on the questionnaire and the form you return to AFIT will not be seen in the Laboratory. Results will be available only on a statistical basis broken down to a division level. Please answer each question honestly and accurately. The first part of the questionnaire is a set of standard demographic questions which help place our Laboratory's statistics into a general context. The second part is about your perception of your work climate. The last part, for S&Es, is about the Laboratory's products.
4. When you have completed the questionnaire, place it in the addressed envelope provided and drop it in the base mail. Questionnaires should be completed by 6 January 1978 which is prior to the start of the next team training session. Thank you for your response. It will help us make AFFDL a more productive organization and a better place to work.

George Lehner
GEORGE LEHNER
CHIEF, AFIT
AFFDL

1 Atch
Questionnaire

DEPARTMENT OF THE AIR FORCE
AIR FORCE FLIGHT DYNAMICS LABORATORY
WRIGHT-PATTERSON AIR FORCE BASE, OHIO 45433



Office of the Commander

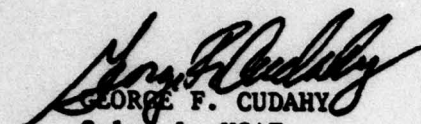
11 DEC 1978

SUBJECT: AFFDL Survey on Effectiveness of
Team Development Program

TO: FB FE FX FG

1. For over three years AFFDL has conducted selected team development programs utilizing the services of Dr. George Lehner. These have included Corporate Board sessions, some division and branch training, work with the Branch Chief's Council, and the Women's Seminar.
2. Last year about this time you may have been asked to complete a questionnaire which established a baseline measurement of our perceptions about our organization. For this second part of a continuing assessment of the effectiveness of the team development program, another measurement using a similar questionnaire is needed to determine if any changes in our perceptions have occurred since last year. Personnel from the technical divisions are being surveyed. Some divisions have had team development sessions and some have not. I have again enlisted the support of AFIT researchers in analyzing the completed questionnaires.
3. Like last year, the measurements will be based on an AFIT-developed questionnaire that takes about 15 minutes to complete. Participation is voluntary but your opinions are really needed to provide a valid statistical survey. Your name is not on the questionnaire and the form you return to AFIT will not be seen in the Laboratory. Results will be available only on a statistical basis broken down to a division level. Please answer each question honestly and accurately. The first part of the questionnaire is a set of standard demographic questions which help place our Laboratory's statistics into a general context. The second part is about your perception of your work climate. The last part, for S&Es, is about the Laboratory's products.
4. When you have completed the questionnaire, place it in the addressed envelope provided and drop it into the base mail. Questionnaires should be completed by 12 January 1979 which is prior to the start of the first team training session for the year. The response

last year to this survey was exceptionally good, an indicator of the personal importance that you have attached to the betterment of AFFDL as a place to work. Thank you for your response.


GEORGE F. CUDAHY
Colonel, USAF
Commander

1 Atch
Questionnaire

PRIVACY ACT STATEMENT

In accordance with para 30, AFR 12-35, Air Force Privacy Act Program, the following information about this survey is provided as required by the Privacy Act of 1974.

a. Authority. This survey information is authorized for solicitation by Federal Statute Title 10, United States Code, Section 8012, Executive Order 9397, DODI 1100.13, 17 April 1968, and AFR 30-23, 22 Sep 76.

b. Principle Purpose. This survey is being conducted to gain the attitudes and opinions of Air Force R&D personnel toward Team Development programs.

c. Routine use. The survey data will be converted to statistical information for use by AFIT researchers and laboratory personnel.

d. Participation in this survey is entirely voluntary.

e. No adverse action of any kind may be taken against any individual who elects not to participate in any or all of this survey.

I. BIOGRAPHIC INFORMATION

Please circle the appropriate letter.

1. How old were you on your last birthday?

- | | |
|-----------------------|------------------|
| A. Less than 25 years | F. 45-49 years |
| B. 25-29 years | G. 50-54 years |
| C. 30-34 years | H. 55-59 years |
| D. 35-39 years | I. Over 59 years |
| E. 40-44 years | |

2. What is your present grade?

- | | |
|-----------------------|-------------|
| A. GS 2-4 | G. E1-E5 |
| B. GS 5-7 | H. E6-E9 |
| C. GS 8-11 | I. 01 or 02 |
| D. GS 12 | J. 03 |
| E. GS 13 | K. 04-05 |
| F. GS 14-16 or PL 313 | |

3. How long have you been assigned to your current division?

- | | |
|----------------------------------|----------------------------------|
| A. Less than 6 months | D. 2 years but less than 3 years |
| B. 6 months but less than 1 year | E. 3 years but less than 4 years |
| C. 1 year but less than 2 years | F. 4 years but less than 5 years |
| | G. More than 5 years |

4. How long have you been assigned to this laboratory?

- | | |
|----------------------|-----------------------|
| A. Less than 2 years | E. 16-20 years |
| B. 2-5 years | F. 21-25 years |
| C. 6-10 years | G. More than 25 years |
| D. 11-15 years | |

5. What is your highest level of formal education?

- A. Some High School (No diploma)
- B. High School Graduate (No College)
- C. Some college or technical school (No degree)
- D. Bachelor's degree
- E. Some graduate work (No degree)
- F. Master's degree
- G. Some work beyond master's degree (No doctorate)
- H. Doctoral degree

6. To which division are you currently assigned?

- A. Aeromechanics
- B. Structural Mechanics
- C. Vehicle Equipment
- D. Collocated in _____
Division from another Organization
- E. Flight Control

7. What is your current job/position?

- A. Clerk, Stenographer or Secretary
- B. Technician
- C. Scientist or engineer
- D. Group leader
- E. Branch chief
- F. Other

II. ORGANIZATIONAL CLIMATE

Please circle the appropriate letter for each of the following eight questions.

8. Which one of the following shows how much of the time you feel satisfied with your job?

- A. Never
- B. Seldom
- C. Occasionally
- D. About half of the time
- E. A good deal of the time
- F. Most of the time
- G. All the time

9. Choose one of the following statements which best tells how well you like your job.

- A. I hate it
- B. I dislike it
- C. I don't like it
- D. I am indifferent to it
- E. I like it
- F. I am enthusiastic about it
- G. I love it

10. Which one of the following best tells how you feel about changing your job?

- A. I would quit this job at once if I could.
- B. I would take almost any other job in which I could earn as much as I am earning now.
- C. I would like to change both my job and my occupation.
- D. I would like to exchange my present job for another one.
- E. I am not eager to change my job, but I would do so if I could get a better job.
- F. I cannot think of any jobs for which I would exchange.
- G. I would not exchange my job for any other.

11. Which one of the following shows how you think you compare with other people?
- A. No one dislikes his job more than I dislike mine.
 - B. I dislike my job much more than most people dislike theirs.
 - C. I dislike my job more than most people dislike theirs.
 - D. I like my job about as well as most people like theirs.
 - E. I like my job better than most people like theirs.
 - F. I like my job much better than most people like theirs.
 - G. No one likes his job better than I like mine.
12. On most work days, how often does time seem to drag for you?
- A. About half the day or more
 - B. About 1/3 of the day
 - C. About 1/4 of the day
 - D. About 1/8 of the day
 - E. Time never seems to drag
13. Some people are completely involved in the job -- they are absorbed in it night and day. For others, their job is simply one of several interests. How involved do you feel in your job?
- A. Very little; my other interests are more absorbing
 - B. Slightly involved
 - C. Moderately involved; my job and my other interests are equally absorbing to me
 - D. Strongly involved
 - E. Very strongly involved; my work is the most absorbing interest in my life.
14. How often do you do extra work for your job which is not really required of you?
- A. Almost every day
 - B. Several times a week
 - C. About once a week
 - D. Once every few weeks
 - E. About once a month or less
15. Would you say you work harder, less hard or about the same as other people doing your type of work in your work organization?
- A. Much harder than most others
 - B. A little harder than most others
 - C. About the same as most others
 - D. A little less hard than most others
 - E. Much less hard than most others

Please indicate your degree of agreement/disagreement, or the extent to which the following exist by circling the appropriate letter for each question.

16. The amount of information you receive about what is going on in the laboratory within your immediate work group is adequate to meet your needs.
- | | |
|-------------------------|----------------------|
| A. Definitely disagree | D. Inclined to agree |
| B. Inclined to disagree | E. Definitely agree |
| C. Undecided | |
17. To what extent do the objectives of your work group support the objectives of the laboratory?
- | | |
|----------------------------|---------------------------|
| A. To a very little extent | D. To a great extent |
| B. To a little extent | E. To a very great extent |
| C. To some extent | |
18. I am given credit for the work I have done.
- | | |
|-------------------------|----------------------|
| A. Definitely disagree | D. Inclined to agree |
| B. Inclined to disagree | E. Definitely agree |
| C. Undecided | |
19. When you talk with your supervisor, to what extent does he pay attention to what you are saying?
- | | |
|----------------------------|---------------------------|
| A. To a very little extent | D. To a great extent |
| B. To a little extent | E. To a very great extent |
| C. To some extent | |
20. As far as I can see, there isn't very much personal loyalty to the laboratory.
- | | |
|-------------------------|----------------------|
| A. Definitely disagree | D. Inclined to agree |
| B. Inclined to disagree | E. Definitely agree |
| C. Undecided | |
21. Within my working group, I can make decisions and solve problems without checking with my supervisor each step of the way.
- | | |
|-------------------------|----------------------|
| A. Definitely disagree | D. Inclined to agree |
| B. Inclined to disagree | E. Definitely agree |
| C. Undecided | |

22. A friendly atmosphere prevails among the people in my work group.
- | | |
|-------------------------|----------------------|
| A. Definitely disagree | D. Inclined to agree |
| B. Inclined to disagree | E. Definitely agree |
| C. Undecided | |
23. The promotion system is effective (i.e., the right/most qualified person generally receives a promotion when one opens up).
- | | |
|-------------------------|----------------------|
| A. Definitely disagree | D. Inclined to agree |
| B. Inclined to disagree | E. Definitely agree |
| C. Undecided | |
24. To what extent does your supervisor maintain high personal standards of performance?
- | | |
|----------------------------|---------------------------|
| A. To a very little extent | D. To a great extent |
| B. To a little extent | E. To a very great extent |
| C. To some extent | |
25. To what extent are those above you willing to listen to your ideas and suggestions?
- | | |
|----------------------------|---------------------------|
| A. To a very little extent | D. To a great extent |
| B. To a little extent | E. To a very great extent |
| C. To some extent | |
26. To what extent do members in your work group help you find ways to improve your performance?
- | | |
|----------------------------|---------------------------|
| A. To a very little extent | D. To a great extent |
| B. To a little extent | E. To a very great extent |
| C. To some extent | |
27. When I am assigned a job, I know what is expected of me.
- | | |
|-------------------------|----------------------|
| A. Definitely disagree | D. Inclined to agree |
| B. Inclined to disagree | E. Definitely agree |
| C. Undecided | |
28. To what extent does your work group plan together and coordinate its efforts?
- | | |
|----------------------------|---------------------------|
| A. To a very little extent | D. To a great extent |
| B. To a little extent | E. To a very great extent |
| C. To some extent | |

29. In my branch the rewards and encouragements you get usually outweigh the threats and the criticism.
- | | |
|-------------------------|----------------------|
| A. Definitely disagree | D. Inclined to agree |
| B. Inclined to disagree | E. Definitely agree |
| C. Undecided | |
30. My supervisor is friendly and easy to approach.
- | | |
|-------------------------|----------------------|
| A. Definitely disagree | D. Inclined to agree |
| B. Inclined to disagree | E. Definitely agree |
| C. Undecided | |
31. When you talk with members in your work group, to what extent do they pay attention to what you are saying?
- | | |
|----------------------------|---------------------------|
| A. To a very little extent | D. To a great extent |
| B. To a little extent | E. To a very great extent |
| C. To some extent | |
32. To what extent do members in your work group exchange opinions and ideas?
- | | |
|----------------------------|---------------------------|
| A. To a very little extent | D. To a great extent |
| B. To a little extent | E. To a very great extent |
| C. To some extent | |
33. People in this organization take pride in the excellence of their performance.
- | | |
|-------------------------|----------------------|
| A. Definitely disagree | D. Inclined to agree |
| B. Inclined to disagree | E. Definitely agree |
| C. Undecided | |
34. In my branch people are rewarded in proportion to the excellence of their job performance.
- | | |
|-------------------------|----------------------|
| A. Definitely disagree | D. Inclined to agree |
| B. Inclined to disagree | E. Definitely agree |
| C. Undecided | |
35. To what extent do you have confidence and trust in members of your work group?
- | | |
|----------------------------|---------------------------|
| A. To a very little extent | D. To a great extent |
| B. To a little extent | E. To a very great extent |
| C. To some extent | |

36. Decisions are usually made by the people with the most relevant information, no matter what their position in the organization.
- | | |
|-------------------------|----------------------|
| A. Definitely disagree | D. Inclined to agree |
| B. Inclined to disagree | E. Definitely agree |
| C. Undecided | |
37. To what extent does your supervisor encourage people to give their best effort?
- | | |
|----------------------------|---------------------------|
| A. To a very little extent | D. To a great extent |
| B. To a little extent | E. To a very great extent |
| C. To some extent | |
38. To what extent are those with whom you work directly willing to share information, ideas and suggestions?
- | | |
|----------------------------|---------------------------|
| A. To a very little extent | D. To a great extent |
| B. To a little extent | E. To a very great extent |
| C. To some extent | |
39. I have the opportunity to influence major decisions within my work group.
- | | |
|-------------------------|----------------------|
| A. Definitely disagree | D. Inclined to agree |
| B. Inclined to disagree | E. Definitely agree |
| C. Undecided | |
40. Around here there is a feeling of pressure to continually improve personal and group performance.
- | | |
|-------------------------|----------------------|
| A. Definitely disagree | D. Inclined to agree |
| B. Inclined to disagree | E. Definitely agree |
| C. Undecided | |
41. Information is widely shared within the laboratory so that those who make decisions have access to all available facts.
- | | |
|-------------------------|----------------------|
| A. Definitely disagree | D. Inclined to agree |
| B. Inclined to disagree | E. Definitely agree |
| C. Undecided | |

42. The amount of information you receive about what is going on within your branch is adequate to meet your needs.
- | | |
|-------------------------|----------------------|
| A. Definitely disagree | D. Inclined to agree |
| B. Inclined to disagree | E. Definitely agree |
| C. Undecided | |
43. To what extent does your supervisor encourage the people who work for him to exchange opinions and ideas?
- | | |
|----------------------------|---------------------------|
| A. To a very little extent | D. To a great extent |
| B. To a little extent | E. To a very great extent |
| C. To some extent | |
44. When decisions are being made, to what extent are the people affected asked for their ideas?
- | | |
|----------------------------|---------------------------|
| A. To a very little extent | D. To a great extent |
| B. To a little extent | E. To a very great extent |
| C. To some extent | |
45. The amount of information you receive about what is going on within your division is adequate to meet your needs.
- | | |
|-------------------------|----------------------|
| A. Definitely disagree | D. Inclined to agree |
| B. Inclined to disagree | E. Definitely agree |
| C. Undecided | |

III. NATURE OF WORK QUESTIONS

This section is to be filled out by scientists and engineers, group leaders and branch chiefs only.

Indicate what percent of your time at work is spent doing each of the activities listed in the next five items. The five items are considered a set, and responses to them should total 100 percent.

- (46,47)* ____% In-House Research and Development
- (48,49) ____% Contract R&D Guidance
- (50,51) ____% Technical Support of Others
- (52,53) ____% Program Administration (includes planning, budgeting, documentation of programs, etc.)
- (54,55) ____% Supervision

Indicate how many of the following you have authored/presented/briefed over the past year.

- (56,57) ____ Published Papers in Professional/Technical Journals
- (58,59) ____ Technical Reports
- (60,61) ____ Technical Memorandums or Test Data Reports
- (62,63) ____ Presentations at Symposia, Meetings of Professional Organizations, and Technical Conferences
- (64,65) ____ Hardware/software Specifications, Statements of Work, Requests for Proposals, Test Plans, and Test Reports.
- (66,67) ____ In-House Studies, Technical and/or Managerial Assessments.
- (68,69) ____ Presentations to General Office Level Audiences (count multiple audiences of same presentation as one).
- (70,71) ____ Professional or Technical Committee participation (external to laboratory).

* Numbers are for keypunching.

Appendix B

A Brief Summary of the Concept of Organizational Climate

A Brief Summary of the Concept of Organizational Climate

Definition

In a review of the conceptual definitions of organizational climate (OC), Stahl [1976] encountered such a range of definitions that he was prompted to "...wonder if the cited authors were all defining the same construct" [p. 11]. Part of the reason for the diversity of opinion surrounding the concept of OC is the polarization of organizational theorists into two opposing camps: those who view OC as an organizational characteristic, and those who regard it as an attribute of the perceiving individual. An example of the former definition is provided by Forehand and Gilmer [1964], who defined OC as:

...the set of characteristics that describe an organization and that (a) distinguish the organization from other organizations, (b) are relatively enduring over time, and (c) influence the behavior of people in the organization [p. 362].

Schneider [1974] provides an example of the other camp. He defines OC as:

...the concepts people share about the organization. As concepts, climate perceptions are meaningful abstractions of sets of cues, the cues being the many specific events, conditions, practices, and procedures that occur in the daily life of an organization. As concepts, climate perceptions help individuals reduce information overload and function as frameworks against which people identify behaviors that will adopt them to their situation. [p. 20].

OC as a Redundant Measure

The difficulty in conceptualizing OC has engendered an acrimonious debate in the literature over whether or not OC is redundant with other measures of individual differences, particularly job satisfaction [James and Jones, 1974; LaFollete and Sims, 1975; Downey et al., 1975]. Current opinion on "...whether organizational climate causes, mediates, or is the same concept as job satisfaction is still an open question" [Woodman, 1978:822]. The author of this quotation went on to say that research results on this subject are contradictory and open to much subjective interpretation.

Measurement of OC

As one might expect with such a "fuzzy" concept as OC, its measurement is also subject to controversy [Johannesson, 1973]. That is not to say, however, that instruments to measure OC do not abound. On the contrary, as the Table indicates, the factor names of the dimensions of OC as measured by some common survey instruments show only a few of the many authors who have developed instruments to measure OC. The variety apparent in the dimensionality of OC as measured by these instruments has occasioned much critical comment, but in a recent review of the literature on this issue Woodman summarized the prevailing opinion:

In the original development of these climate instruments, their validity often seemed promising, but when their use was extended to other organizational settings, and a broader spectrum of organiz-

Table B-1
Factor Names of Various Measures of
Organizational Climate
[Johannesson, 1973]

<u>Litwin & Stringer [1968]</u>	<u>Schneider & Bartlett [1968]</u>	<u>Payne & Pheysy [1971]</u>	<u>Meyer [1968]</u>	<u>Friedlander & Marguiles [1969]</u>
Structure	Managerial Structure	Organizational Progressiveness	Organizational Clarity	Disengagement
Responsibility	Managerial Support	Normative Control	Responsibility	Thrust
Rewards	General Satisfaction		Rewards	Consideration
Risk	Concern for New Employees		Constraining Conformity	Hindrance
Warmth	Agent Independence		Friendly Team Spirit	Intimacy
Conflict	Intra-agency Conflict			Aloofness
Standards			Standards	Production Emphasis
Identity				Espirit

ational members was involved, research findings often have indicated a large variance in factor structure. In general, the factor structure of organizational climate instruments cannot be assumed to generalize from one type of organization to another. Further, it seems that no one yet has arrived at a climate inventory that will manifest high scale validity and reliability across many different organizations. In use, a conservative approach is to revise any established climate instrument for the environment involved. [1978:822] [emphasis added]

Because of this commonly held view of the vague organizational attributes of OC (i.e., its failure to generalize across organizations), most researchers do tailor OC instruments to the specific organization being measured. In this context, OC "...while certainly not unchanging, nevertheless has an air of permanency or at least some continuity over time" [Woodman, 1978:818]. These views and the fact that many of the OC questions used in the current instrument were used in the measurement of OC in similar organizations [Westover, 1975] provided the methodological justification for the treatment of OC within AFFDL during this research.

Usefulness of OC

As noted in the introduction to this thesis, Likert's model of organizational change contains an intervening class of variables that, although not termed OC, coincides closely the definition of OC as a measure of the employee's perceptions of his organization. As the reader will recall, however, Likert stated that OC-type perceptual measures were intervening variables in the change process, not causal

ones. Many researchers would agree with Likert that OC may be an indirect determinant of behavior, at least in a correlational sense. Moreover, the relatively slow changing nature of OC makes it ideally suited to measure the change in individual perceptions that are a primary target of most (including this) OD interventions.

Appendix C

**Factor Analysis of Organizational
Climate Items**

Factor Analysis of Climate Questions - Combined Data (N=719)

THIS PAGE IS BEST QUALITY PRACTICABLE
FROM COPY FURNISHED TO DDC

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
016	.16276	.15796	.16520	.74408	.11029
017	.32292	.14957	.19799	.37274	.18613
018	.12858	.57734	.38010	.07431	.17348
019	.21166	.65173	.16539	.08713	.33670
020	-.16355	-.16777	-.55417	-.11113	-.15853
021	.17122	.64711	-.02379	.19320	-.15655
022	.55163	.37101	.12052	.01827	.06888
023	.09240	.10289	.09428	.17194	.03540
024	.14921	.37419	.22174	.13732	.62870
025	.24943	.45102	.29913	.32405	.05506
026	.61403	.16274	.19977	.06212	.23169
027	.19713	.34603	.22965	.27486	.13439
028	.47181	.10122	.24462	.37313	.33179
029	.20002	.61114	.13252	.08194	.13886
030	.21516	.62001	.01331	.11306	.32519
031	.71711	.25003	.01057	.09259	.81399
032	.76238	.07052	.07590	.15319	.10097
033	.51110	.14781	.17566	.09173	.14716
034	.16122	.31252	.15040	.08716	.20900
035	.71867	.24854	.22246	.08486	.11410
036	.10700	.14352	.16399	.18355	.06166
037	.16127	.26804	.17032	.16380	.75501
038	.70896	.16323	.10783	.11210	.09112
039	.39061	.43372	-.11516	.35368	-.01363
040	.11272	-.17173	.29550	.13203	.60277
041	.09027	.13091	.55437	.40378	.20580
042	.10702	.23178	.10430	.17308	.20319
043	.29046	.40041	.16531	.28170	.60390
044	.17979	.31130	.43350	.32195	.24027
045	.03302	.01170	.40553	.71122	.13603
Eigenvalue	10.35	2.11	1.53	1.32	1.22
Percent Variance Explained	34.5	7.0	5.1	4.4	4.1

Factor Analysis of Climate Questions - 1978 Data (N=322)

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
Q16	.14148	.17805	.16741	.20557	.74229
Q17	.21585	.29735	.18179	.20461	.25062
Q18	.18375	.43113	.28127	.38156	.12068
Q19	.25604	.72073	.50511	.52825	.12833
Q20	-.11771	-.66058	-.10559	-.10593	-.10024
Q21	.14203	.12220	-.10330	.73551	.02042
Q22	.52071	.11731	.11509	.38749	.03981
Q23	.00059	.55624	.15938	-.04953	.24041
Q24	.19012	.22370	.60930	.30502	.10862
Q25	.25303	.46611	.18774	.33252	.23123
Q26	.66131	.15871	.21549	-.06105	.16907
Q27	.19109	.23055	.17735	.51862	.25233
Q28	.42385	.15713	.37658	.13083	.37574
Q29	.22315	.51045	.28935	.17362	.18217
Q30	.23701	.17071	.42224	.57233	.02852
Q31	.71013	.10022	.19307	.17008	.00170
Q32	.77362	.15177	.18212	.00842	.15626
Q33	.51710	.49537	.11710	.19776	.05300
Q34	.16432	.67101	.28673	.11093	.13722
Q35	.72030	.21091	.15251	.22036	.09136
Q36	.51785	.61072	.10521	.10593	.23208
Q37	.14709	.11120	.78292	.15125	.24514
Q38	.64037	.14979	.10937	.16035	.13647
Q39	.54320	.11057	.10912	.39117	.08824
Q40	.07051	.25177	.58255	-.35259	.04520
Q41	.13510	.41001	.15967	.00475	.45079
Q42	.19767	.11093	.25919	.17103	.75104
Q43	.34032	.19329	.60032	.26049	.25195
Q44	.27469	.51060	.27344	.21617	.25574
Q45	.08511	.35501	.10032	-.00779	.75082
Eigenvalue	10.39	2.28	1.50	1.43	1.24
Percent Variance Explained	34.6	7.6	5.0	4.8	4.1

THIS PAGE IS BEST QUALITY PRINTING
FROM COPY FURNISHED TO DDC

Factor Analysis of Climate Questions - 1979 data (N=387)

	FACTOR 1	FACTOR 2	FACTOR 3	FACTOR 4	FACTOR 5
016	.10030	.21850	.17737	.73279	.18504
017	.47046	-.12094	.12344	.39843	.21015
018	.15000	.6332	.30547	.05924	.10382
019	.16020	.71200	.13334	.11424	.25096
020	-.17392	-.07037	-.40115	-.16750	-.35012
021	.21740	.49700	.12489	.28632	-.17823
022	.61000	.31700	.21111	.09942	-.08154
023	.10000	.05000	.71120	.14275	-.12331
024	.11000	.37000	.23070	.12074	.62300
025	.28101	.50700	.11017	.37757	.10377
026	.53000	.00270	.15953	-.03910	.22059
027	.17211	.23270	.27001	.20593	.25002
028	.47007	.15020	.27001	.35837	.31173
029	.22823	.63202	.13937	.12074	.04320
030	.25270	.62070	.34375	.20001	.30050
031	.67317	.32070	.09943	.16038	-.13003
032	.70000	.12233	.00020	.15643	.21252
033	.40000	.10020	.31111	.14277	.20223
034	.20102	.30000	.10000	.05210	.14119
035	.60000	.20000	.10000	.09370	.19022
036	.10000	.10000	.10000	.13025	.21013
037	.19000	.30130	.10000	.06177	.70001
038	.70000	.15070	.10000	.11993	.19267
039	.20000	.30103	-.03900	.58271	-.00491
040	.10000	-.10000	.12019	.15042	.60000
041	.10000	-.10000	.50001	.35012	.30037
042	.03300	.20000	.32122	.08700	.17330
043	.19842	.47257	.05022	.27370	.50023
044	.00103	.30000	.30000	.34643	.23074
045	.00200	.10000	.45075	.60000	.13077
Eigenvalue	10.43	2.08	1.59	1.34	1.29
Percent Variance Explained	34.8	6.9	5.3	4.5	4.3

THIS PAGE IS BEST QUALITY PRACTICES
FROM COPY FURNISHED TO DDQ

Appendix D

Organizational Climate Factor
Validity Data

Organizational Climate
Factor One
Quality of Immediate Work Group

	<u>Q22</u>	<u>Q26</u>	<u>Q28</u>	<u>Q31</u>	<u>Q32</u>	<u>Q35</u>	<u>Q38</u>
Q22	1.0	.31	.30	.41	.40	.49	.47
Q26		1.0	.42	.41	.44	.45	.42
Q28			1.0	.38	.46	.44	.37
Q31				1.0	.56	.52	.49
Q32					1.0	.55	.54
Q35						1.0	.54
Q38							1.0

All correlations
significant at $p=.001$

Figure D-1. Item Intercorrelations

	<u>HOPP</u>	<u>PATCH</u>	<u>P1</u>	<u>P2</u>	<u>P3</u>
F1	.28****	.09*	.15****	-.14***	-.10**

* $p=.01$ ** $p=.02$ *** $p=.003$ **** $p=.001$

Figure D-2. Factor Score Correlations

NOTE: N=719 except for correlations with Productivity Factors (P1 - P3), where N=446

Organizational Climate
Factor Two
Employee/Supervisor Interaction

	<u>Q18</u>	<u>Q19</u>	<u>Q21</u>	<u>Q25</u>	<u>Q29</u>	<u>Q30</u>	<u>Q39</u>
Q18	1.0	.53	.31	.39	.55	.38	.27
Q19		1.0	.29	.50	.50	.60	.36
Q21			1.0	.30	.34	.29	.37
Q25				1.0	.43	.35	.39
Q29	All correlations significant at $p=.001$				1.0	.49	.34
Q30						1.0	.36
Q39							1.0

Figure D-3. Item Intercorrelations

	<u>HOPP</u>	<u>PATCH</u>	<u>P1</u>	<u>P2</u>	<u>P3</u>
F2	.37*	.14*	-.03	.02	-.05
* $p=.001$ (all other correlations are non-significant)					

Figure D-4. Factor Score Correlations

NOTE: N=719 except for correlations with Productivity Factors (P1 - P3), where N=446

Organizational Climate
Factor Three
Organizational Warmth

	<u>Q20</u>	<u>Q23</u>	<u>Q29</u>	<u>Q33</u>	<u>Q34</u>	<u>Q36</u>	<u>Q41</u>	<u>Q44</u>
Q20 ^a	1.0	-.27	-.30	-.40	-.35	-.37	-.35	-.32
Q23		1.0	.31	.30	.48	.37	.37	.38
Q29			1.0	.40	.60	.32	.27	.44
Q33				1.0	.46	.40	.35	.39
Q34					1.0	.39	.38	.47
Q36						1.0	.41	.47
Q41							1.0	.39
Q44								1.0
	All correlations significant at p=.001							
	^a question has reversed polarity							

Figure D-5. Item Intercorrelations

	<u>HOPP</u>	<u>PATCH</u>	<u>P1</u>	<u>P2</u>	<u>P3</u>
F3	.23*	-.02	-.05	-.03	-.05
	*p=.001 (all others non-significant)				

Figure D-6. Factor Score Correlations

NOTE: N=719 except for correlations with Productivity Factors (P1 - P3), where N=446

Organizational Climate
Factor Four
Quality of Organizational Communication

	<u>Q16</u>	<u>Q41</u>	<u>Q42</u>	<u>Q45</u>
Q16	1.0	.37	.60	.56
Q41		1.0	.37	.48
Q42			1.0	.64
Q45				1.0

all correlations significant
at $p=.001$

Figure D-7. Item Intercorrelations

	<u>HOPP</u>	<u>PATCH</u>	<u>P1</u>	<u>P2</u>	<u>P3</u>
F4	.20*	.21*	.07	.04	.03

* $p=.001$ (all others non-significant)

Figure D-8. Factor Score Correlations

NOTE: N=719 except for correlations with Productivity Factors (P1 - P3), where N=446

Organizational Climate
Factor Five
Supervisory Support

	<u>Q24</u>	<u>Q37</u>	<u>Q40</u>	<u>Q43</u>
Q24	1.0	.63	.31	.54
Q37		1.0	.38	.63
Q40			1.0	.30
Q43				1.0
all correlations significant at $p=.001$				

Figure D-9. Item Intercorrelations

	<u>HOPP</u>	<u>PATCH</u>	<u>P1</u>	<u>P2</u>	<u>P3</u>
F5	.10*	.03	-.03	-.05	-.00
* $p=.003$ (all others non-significant)					

Figure D-10. Factor Score Correlations

NOTE: N=719 except for correlations with Productivity Factors (P1 - P3), where N=446

Appendix E

Factor Analysis and Validity Data
for Productivity Items

Productivity Factor Analysis

(N=451)#

Factor One (P1) Management Studies

	<u>Q55</u>	<u>Q56</u>	<u>Q57</u>	<u>Q58</u>
Q55	1.0	.28	.12	.20
Q56		1.0	.44	.18
Q57			1.0	.28
Q58				1.0

Table E-1. Item Intercorrelations (P1)

Factor Two (P2) External Professional Development

	<u>Q51</u>	<u>Q54</u>	<u>Q58</u>
Q51	1.0	.36	.06
Q54		1.0	.36
Q58			1.0

Table E-3. Item Intercorrelations (P2)

	<u>HOPP</u>	<u>PATCH</u>
P1	.03	.17***

Table E-2. Factor Score Correlations (P1)

	<u>HOPP</u>	<u>PATCH</u>
P2	.09**	.27***

Table E-4. Factor Score Correlations (P2)

p=.03 *p=.001

Factor Three (P3) Technical Data

	<u>Q52</u>	<u>Q53</u>
Q52	1.0	.47
Q53		1.0

Table E-5. Item Intercorrelations (P3)

	<u>HOPP</u>	<u>PATCH</u>
P3	.04	.01
(both correlations non-significant)		

Table E-6. Factor Score Correlations (P3)

Based on an N of 451, the following significance levels apply:
 r less than or equal to $\pm .14$; p=.001
 r equal to $\pm .11$; p=.01
 r equal to $\pm .08$; p=.05

Appendix F

Data Analysis for Homogeneous Groups

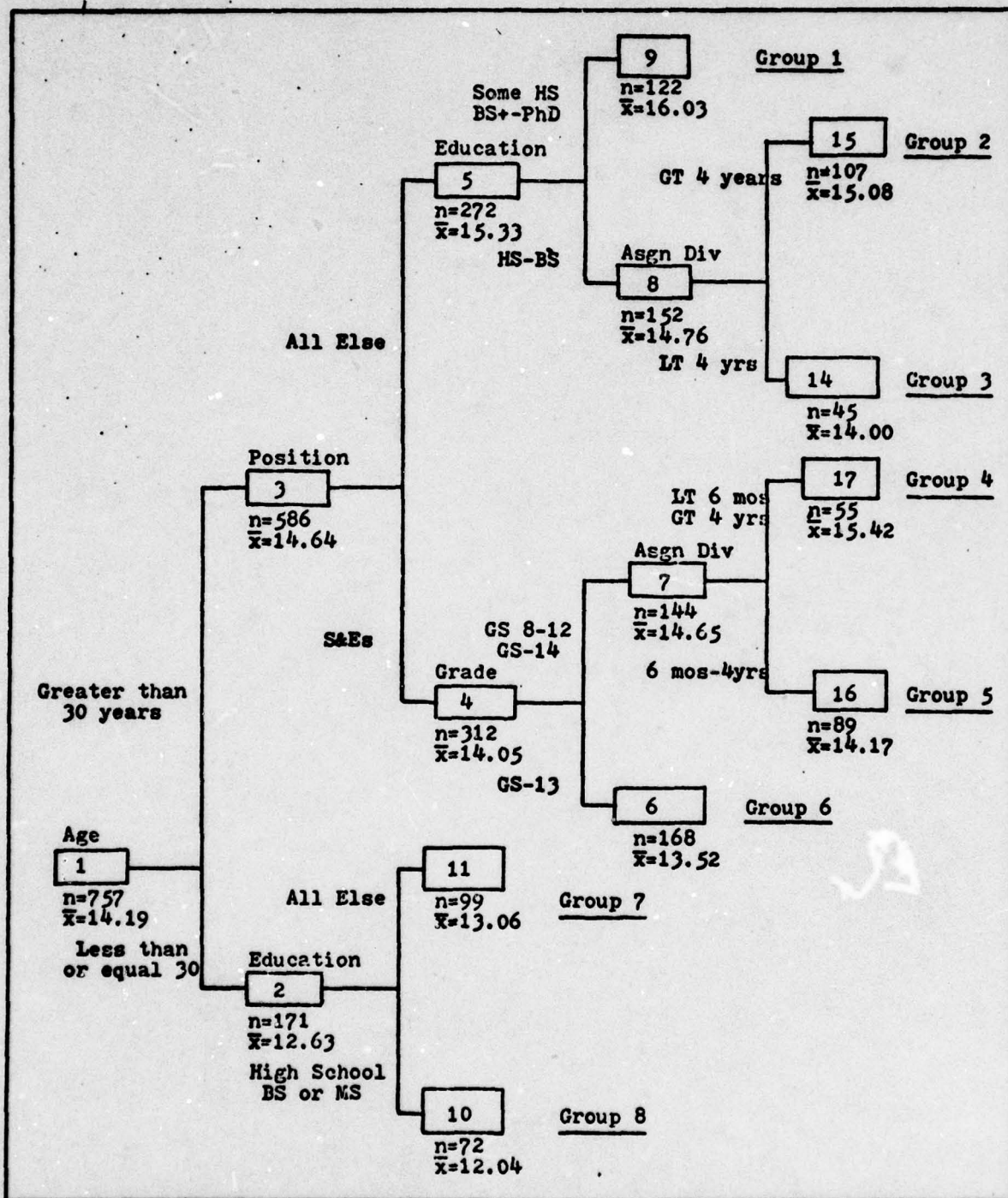


Figure F-1. AID Tree: Job Motivation (Patchen)

Table F-1
Differences Among Divisions on Patchen Scores
Homogeneous Groups

*p=.055.

Group	Short Name	Mean and (Std Dev)								F-Value	
		FX		FB		FE		FG		1978	1979
		1978	1979	1978	1979	1978	1979	1978	1979	1978	1979
1	Older, non-S&Es who are better educated	15.62 (2.62) n=21	15.13 (2.07) n=15	16.19 (2.93) n=16	16.07 (2.70) n=14	16.68 (1.53) n=19	16.67 (1.72) n=15	15.50 (1.92) n=18	.98	1.41	
2	Older, non-S&Es, less educated & assigned to Div GT 4 years	15.75 (2.12) n=20	15.29 (2.61) n=14	14.75 (3.19) n=16	14.64 (3.24) n=22	15.50 (1.68) n=12	15.13 (2.62) n=15	16.50 (1.87) n=6	.82	.53	
3	Older, non-S&Es, less educated & assigned to Div LT 4 years	12.80 (4.32) n=5	15.50 (1.73) n=4	14.17 (3.71) n=6	12.71 (3.15) n=7	13.56 (5.62) n=9	14.88 (3.52) n=8	16.00 (1.22) n=5	.11	1.27	
4	Older S&Es, GS 8-12 or GS-14, in Div LT 6mos or GT 4yrs	14.42 (2.39) n=12	15.00 (2.11) n=10	13.68 (2.43) n=19	13.92 (2.71) n=12	14.25 (3.25) n=12	14.89 (2.67) n=9	13.57 (2.77) n=14	.33	.84	
5	Older S&Es, GS 8-12 or GS-14, in Div 6 mos-4 years	16.57 (1.13) n=7	15.00 (2.92) n=5	14.92 (2.36) n=13	16.83 (2.64) n=6	15.43 (1.99) n=7	16.75 (1.26) n=4	14.25 (3.82) n=12	1.51	1.19	
6	Older S&Es, GS-13s	12.41 (2.68) n=27	13.53 (2.93) n=32	13.50 (3.53) n=36	13.96 (2.86) n=26	14.61 (2.86) n=16	14.33 (3.35) n=15	13.67 (4.39) n=15	3.01*	.23	
7	Younger employees w/ PhD or working on advanced degree	12.13 (3.76) n=8	12.14 (5.05) n=7	13.37 (3.50) n=19	13.13 (3.29) n=15	12.92 (3.33) n=13	13.45 (2.16) n=11	13.35 (2.38) n=26	.36	.34	
8	Younger employees w/ BS or MS terminal degree	12.43 (1.62) n=7	12.00 (2.97) n=11	11.29 (4.00) n=14	11.50 (3.11) n=4	12.00 (4.24) n=9	10.83 (3.11) n=6	13.26 (3.05) n=19	.41	1.20	

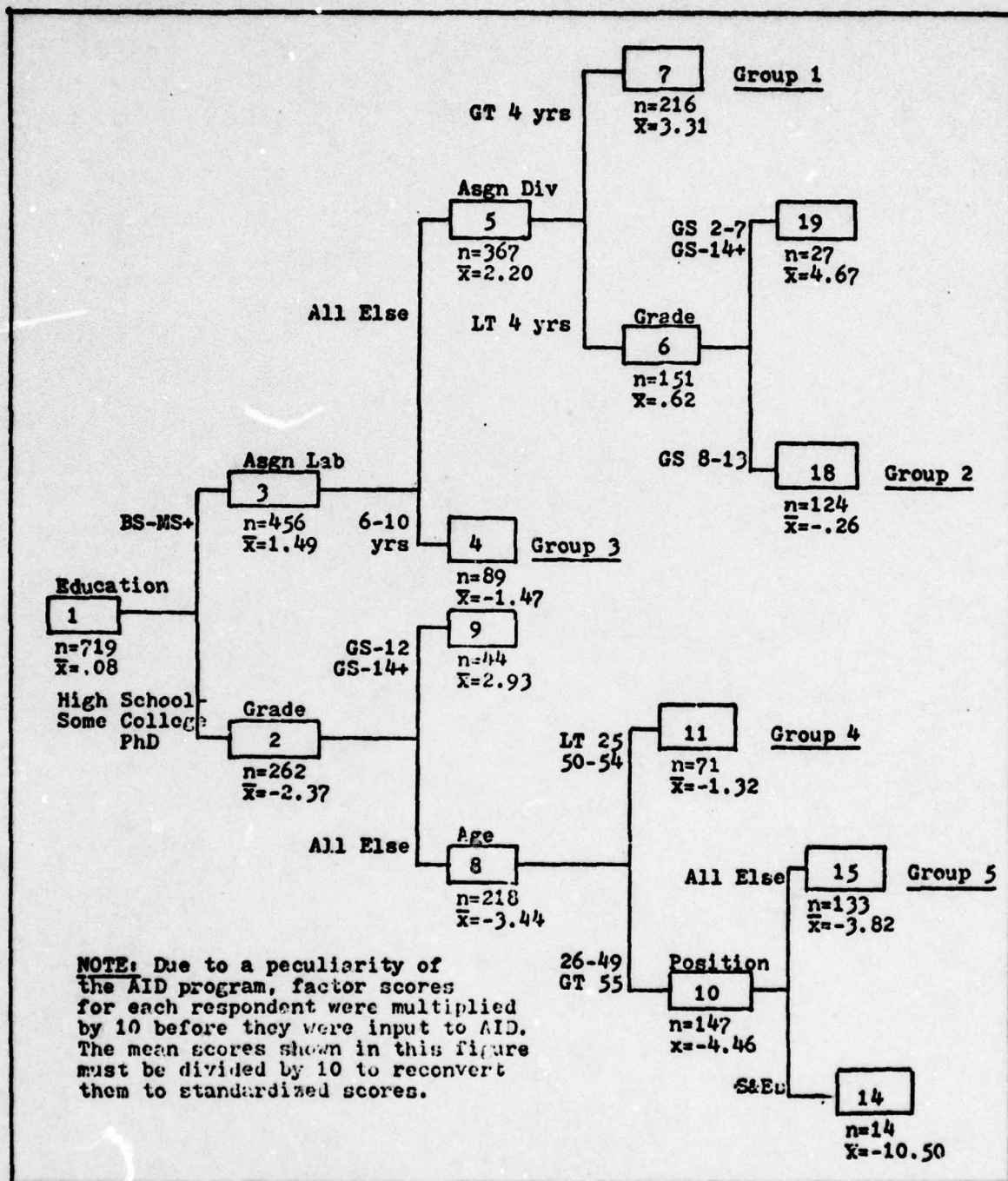


Figure F-2. AID Tree: Organizational Climate:
Factor One (F1), Immediate Work Group

Table F-2

Differences Among Divisions on Organizational
Climate Factor One: Homogeneous Groups

Group	Short Name	Mean and (Std Dev)								F-Value	
		FX		FB		FE		FG		1978	1979
		1978	1979	1978	1979	1978	1979	1978	1979	1978	1979
1	College grads, BS-MS+ in Lab LT 6yrs or GT 10yrs & in Div GT 4yrs	.37 (.87) n=31	-.08 (1.03) n=34	.60 (.75) n=41	.32 (.83) n=36	.65 (.80) n=26	.41 (1.07) n=24	-.10 (.86) n=22	1.05	2.15	
2	College Grads, BS-MS+ in Lab LT 6yrs or GT 10yrs & in Div LT 4yrs	-.21 (.79) n=16	-.29 (.31) n=11	.02 (.87) n=26	-.26 (.91) n=8	-.18 (1.12) n=16	-.08 (.89) n=14	.16 (.79) n=32	.41	1.35	
3	College grads, BS-MS+ in Lab 6-10 years	.21 (.91) n=14	-.25 (.89) n=16	-.39 (1.24) n=14	-.04 (1.07) n=8	.35 (.46) n=7	-.14 (.84) n=9	-.47 (.99) n=19	1.83	.52	
4	HS-some college, GS2- 11, GS-13s, either LT 25 yrs old, or 50-54	-.04 (.63) n=9	.00 (.72) n=9	-.45 (1.32) n=13	-.09 (1.38) n=13	-.34 (1.11) n=7	.21 (.45) n=7	.36 (.44) n=9	.65	.36	
5	HS-some college, GS 2- 11, GS-12s, either 26- 50 yrs old or GT 54, & not an S&W	-.13 (1.04) n=14	-.16 (.61) n=11	-.54 (1.31) n=25	-.41 (.98) n=26	-.30 (1.07) n=20	-.52 (.81) n=19	-.30 (.77) n=15	.43	.73	

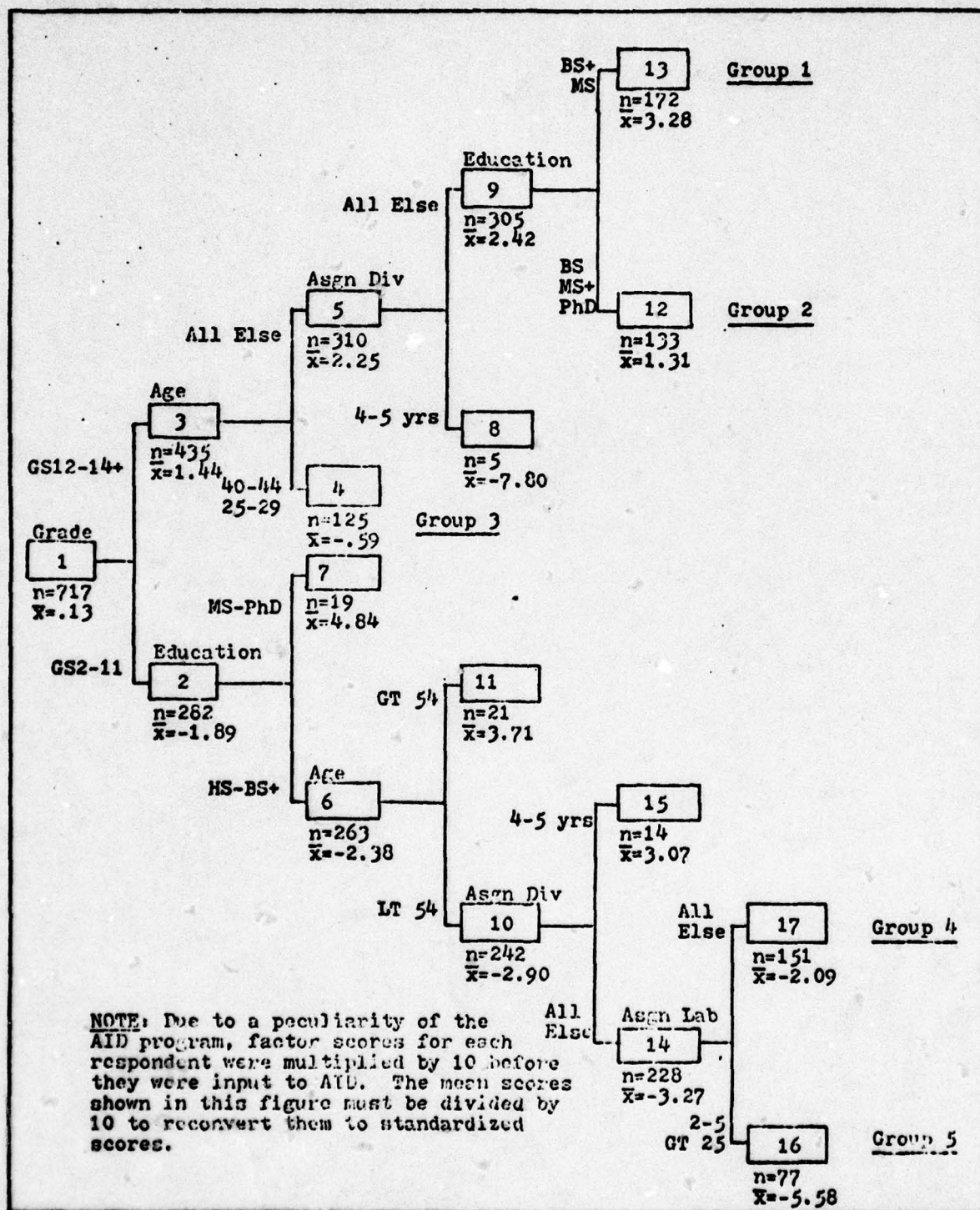


Figure F-3. AID Tree: Organizational Climate: Factor Two (F2)

Table F-3
Differences Among Divisions on Organizational Climate Factor Two:
Homogeneous Groups

Group	Short Name	Mean and (Std Dev)						F-Value	
		FX		FB		FE		1978	1979
		1978	1979	1978	1979	1978	1979	1978	1979
1	Higher grade college grads (BS+,MS) not 25-29 or 40-44 & not in Div 4-5 years	.24 (.91) n=25	.26 (.87) n=19	.27 (.88) n=25	.21 (.92) n=22	.12 (.77) n=21	.34 (.69) n=14	.20	.07
2	Higher grade college grads(BS,MS+,PhD), not 25-29 or 40-44 & not in Div 4-5 years	.11 (1.33) n=28	.19 (1.07) n=24	.33 (.98) n=37	.32 (.99) n=14	.27 (.65) n=15	.21 (.72) n=14	.36	.06
3	Higher grade college grads 25-29 Or 40-44 years old	.20 (.83) n=19	-.13 (1.03) n=24	-.19 (.96) n=24	.46 (.50) n=15	-.03 (.99) n=13	-.51 (1.21) n=14	.90	2.23
4	Lower grade, less educated employees LT 54 yrs old, in Div 4-5 yrs and in Lab LT 2 or 6-25 years	-.37 (1.01) n=19	.00 (.86) n=13	-.26 (1.08) n=21	-.21 (.95) n=26	-.15 (.80) n=17	-.34 (.94) n=20	.18	.86
5	Lower grade, less educated employees LT 54 yrs old, not in Div 4-5 yrs, asgnd to Lab 2-5 yrs or GT 25 yrs	-.96 (.85) n=5	-.80 (1.40) n=9	-.73 (1.45) n=16	-.82 (1.15) n=14	-1.06 (1.50) n=7	-.45 (1.29) n=10	.15	.72

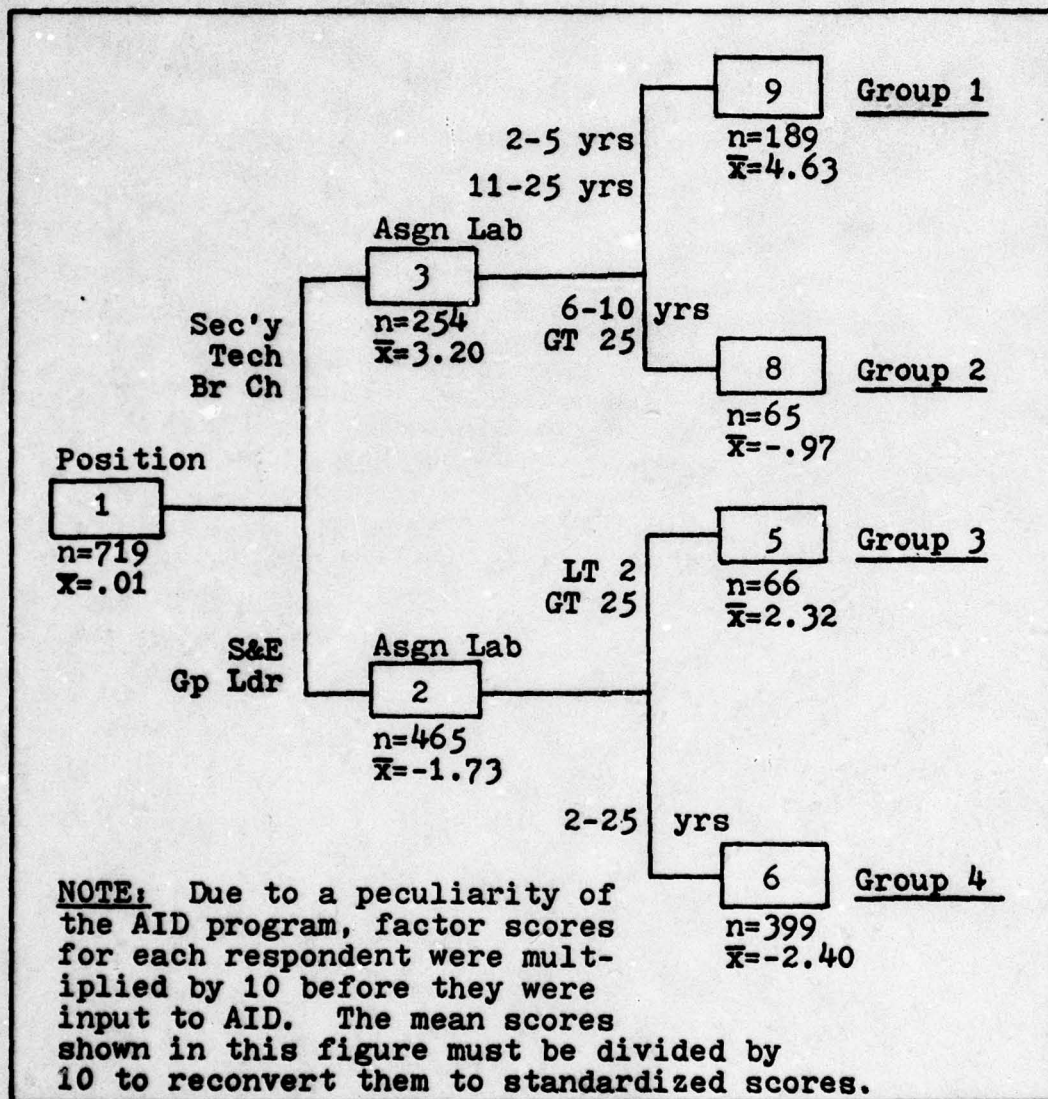


Figure F-4. Organizational Climate Factor Three:
AID Tree

Table F-4
Differences Among Divisions on Organizational
Climate Factor Three: Homogeneous Groups

Group	Short Name	Mean and (Std Dev)						F-Value	
		FX		FB		FE		1978	1979
		1978	1979	1978	1979	1978	1979	1978	1979
1	Sec'ys, Techs & Br Chs in Lab LT 5yrs or 11-25 years	.45 (.85) n=20	.46 (.76) n=16	.43 (.94) n=34	.53 (.92) n=32	.39 (.85) n=29	.15 (1.01) n=25	.67 (.77) n=27	.04 1.25
2	Sec'ys, Techs & Br Chs in Lab 6-10 or GT 25 years	-.23 (1.05) n=10	-.24 (.77) n=10	-.15 (.91) n=11	.01 (.65) n=11	-.39 (1.20) n=6	.14 (1.20) n=9	.33 (1.41) n=4	.21 .39
3	S&Es & Gp Ldrs in Lab LT 2 or GT 25 years	.30 (.67) n=10	-.18 (1.32) n=10	.26 (.82) n=7	.51 (.60) n=4	.62 (.56) n=5	.15 (.76) n=7	.21 (.96) n=22	.45 .56
4	S&Es and Gp Ldrs in Lab 2-25 yrs	-.45 (1.00) n=62	-.46 (.97) n=59	-.02 (1.08) n=83	-.04 (.89) n=51	-.37 (1.09) n=45	-.27 (1.07) n=39	-.20 (.85) n=57	3.44* 1.90
*p=.04									

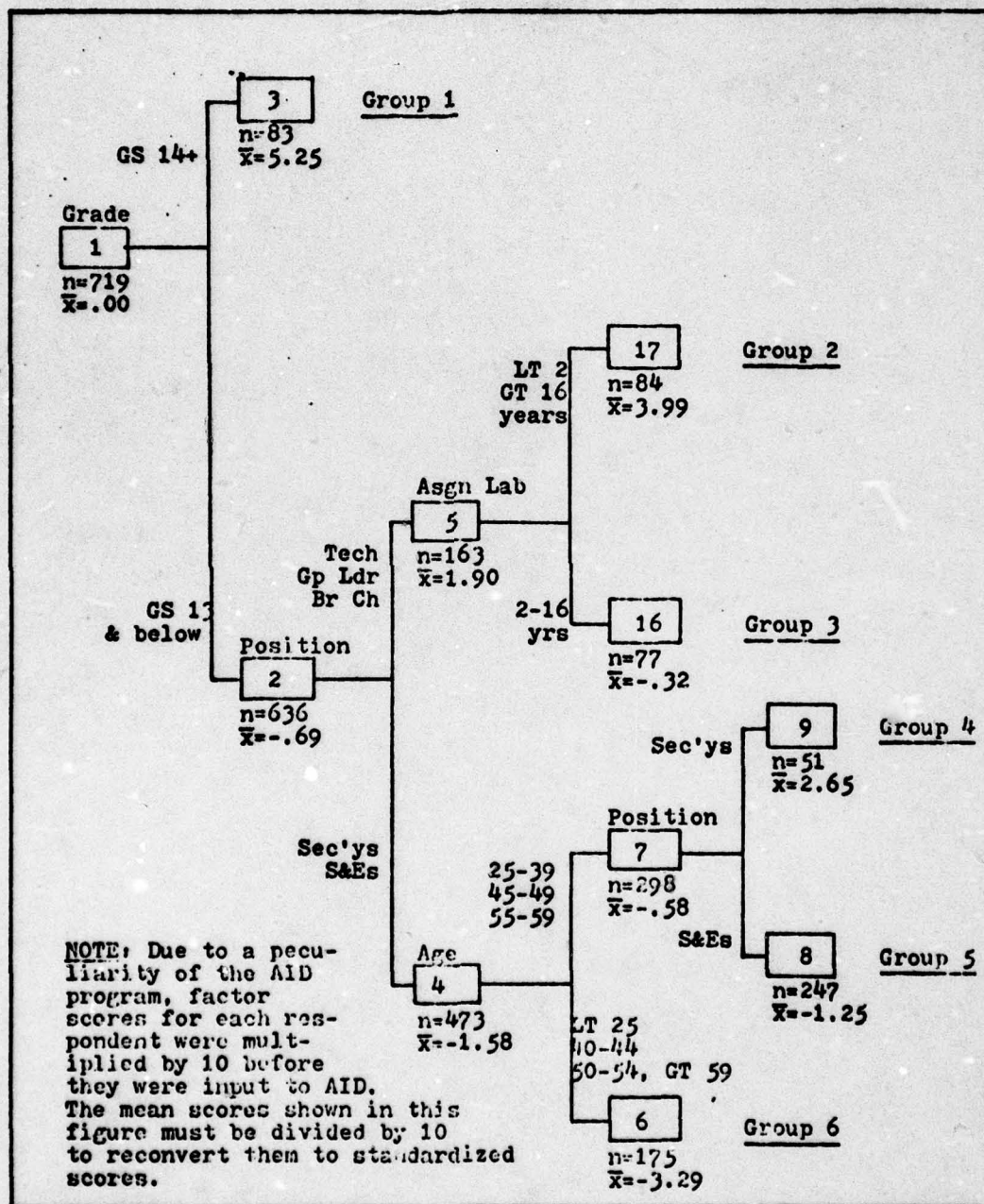


Figure F-5. AID Tree: Organizational Climate
Factor Four (F4), Organizational Communication

Table F-5
Differences Among Divisions on Organizational
Climate Factor Four: Homogeneous Groups

Group	Short Name	Mean and (Std Dev)								F-Value	
		FX		FB		FE		FG	1978	1979	
		1978	1979	1978	1979	1978	1979	1979	1978	1979	
1	GS-14s and above, incl military equivalent	.40 (.99) n=15	.01 (.86) n=13	.43 (.74) n=15	.56 (.88) n=10	.58 (.91) n=8	.93 (.79) n=11	1.08 (1.06) n=8	.12	3.20**	
2	GS-13s & below, in Lab LT 2 or GT 16 yrs; Techs, Gp Ldrs, Br Chs	.24 (.99) n=17	.17 (1.08) n=12	.36 (.73) n=16	.27 (.82) n=13	.06 (.56) n=5	.79 (.82) n=9	.96 (.99) n=8	.42	1.32	
3	GS-13s & below, in Lab 2-16 yrs; Techs, Gp Ldrs & Br Chs	-.24 (1.01) n=8	-.43 (1.12) n=7	-.20 (.87) n=12	.08 (.87) n=15	-.08 (.64) n=17	.12 (.86) n=13	.34 (1.10) n=7	.14	.93	
4	Mostly younger GS-13s & below; Sec'ys & Other	-.02 (1.61) n=7	.59 (1.34) n=2	.46 (.64) n=11	.01 (.78) n=8	.40 (1.12) n=8	.59 (1.13) n=6	.20 (1.03) n=10	.43	.47	
5	Mostly younger S&Es, GS-13 and below	-.23 (.61) n=33	-.08 (1.10) n=35	-.32 (1.14) n=47	.02 (.85) n=31	-.28 (1.12) n=30	.37 (1.17) n=20	-.08 (.99) n=49	.08	1.05	
6	Mostly older S&Es, Sec'ys & Others	-.71 (.73) n=24	-.54 (.84) n=26	-.11 (1.03) n=34	-.17 (.88) n=21	-.45 (1.14) n=17	-.23 (1.09) n=21	-.18 (.89) n=28	2.09	.84	
**p=.04											

Table F-6

Differences Among Divisions on Organizational
Climate Factor Five: Homogeneous Groups

Group	Short Name	Mean and (Std Dev)								F-Value	
		FX		FB		FE		FG		1978	1979
		1978	1979	1978	1979	1978	1979	1978	1979		
1	Lower educated employees in Div LT 6 mos or 1-3 years	1.14 (1.28) n=8	.70 (.89) n=7	.28 (.92) n=11	.36 (.77) n=17	1.42 (.90) n=7	.29 (1.39) n=6	.70 (.49) n=13	3.03	1.08	
2	Lower educated employees in Div 6 mos - 1 year or GT 3 years	.15 (.77) n=17	.29 (.94) n=15	-.13 (1.03) n=26	-.04 (1.29) n=21	.27 (.89) n=21	.48 (.75) n=21	.32 (.70) n=10	.85	.88	
3	Higher educated employees in Lab LT 2 years	.35 (.47) n=8	.73 (.97) n=6	-.37 (1.35) n=6	-.31 (0) n=1	.07 (.45) n=7	.31 (.88) n=6	.28 (.81) n=21	1.35	.66	
4	BS+ or PhD employees in Lab GT 2 yrs, GS8-12 or GS-14+, Gp Ldr & below	.15 (.79) n=15	.48 (.91) n=10	-.35 (1.13) n=24	-.69 (1.13) n=13	.48 (1.11) n=13	.49 (.72) n=15	-.06 (.89) n=20	2.88	4.75**	
5	BS+ or PhD employees, mostly GS-13s in Lab GT 2 yrs, Gp Ldr & below	-.02 (1.16) n=16	-.33 (1.10) n=16	-.30 (1.00) n=15	.08 (1.02) n=12	.07 (.87) n=6	-.24 (1.22) n=3	-.44 (.68) n=9	.37	.55	
6	Mostly younger Gp Ldrs & below, in Lab GT 2 yrs, w/ BS,MS,MS+	-.17 (.74) n=15	.03 (.75) n=15	-.58 (1.40) n=12	-.05 (.69) n=6	-.09 (.76) n=12	.32 (.97) n=9	.11 (.90) n=24	.87	.30	
7	Mostly older Gp Ldrs & below, in Lab GT 2 yrs, w/ BS,MS,MS+	-.41 (1.00) n=19	-.14 (.74) n=22	-.38 (.84) n=26	.49 (.76) n=18	.01 (.64) n=12	-.72 (1.11) n=16	-.38 (1.08) n=19	1.07	1.28	
**p=.005											

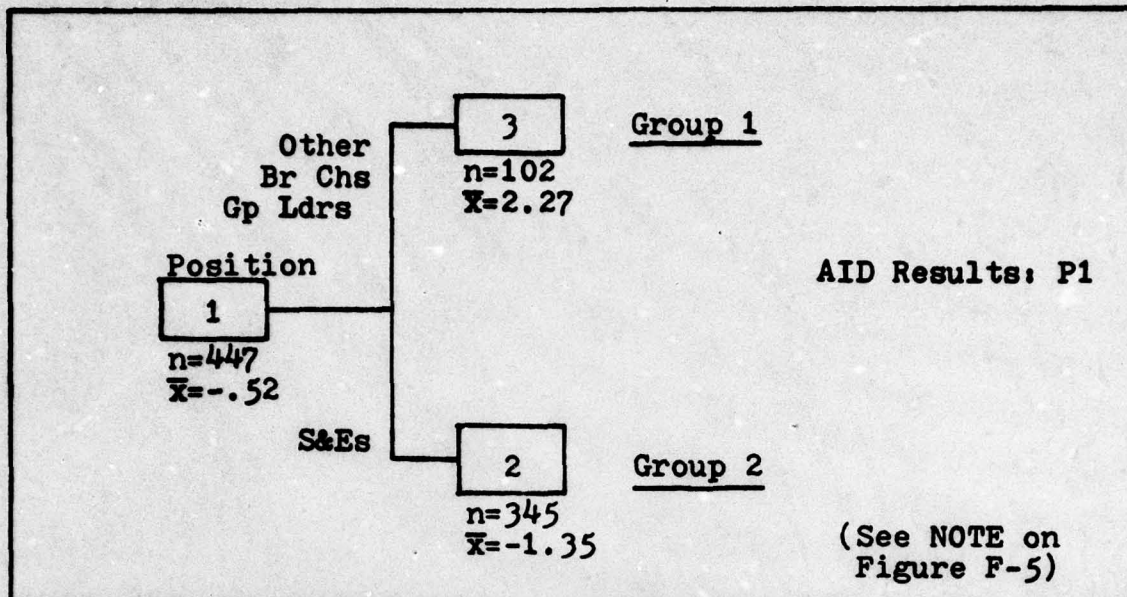


Figure F-7. Productivity Factor One (P1): AID Tree

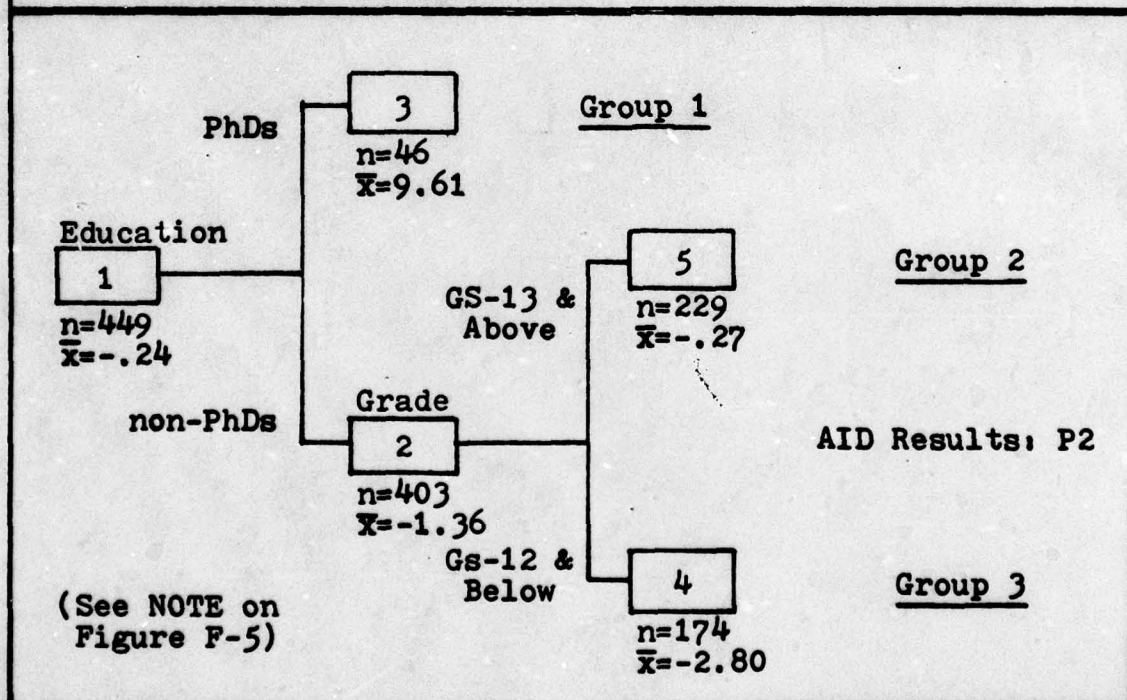


Figure F-8. Productivity Factor Two (P2): AID Tree

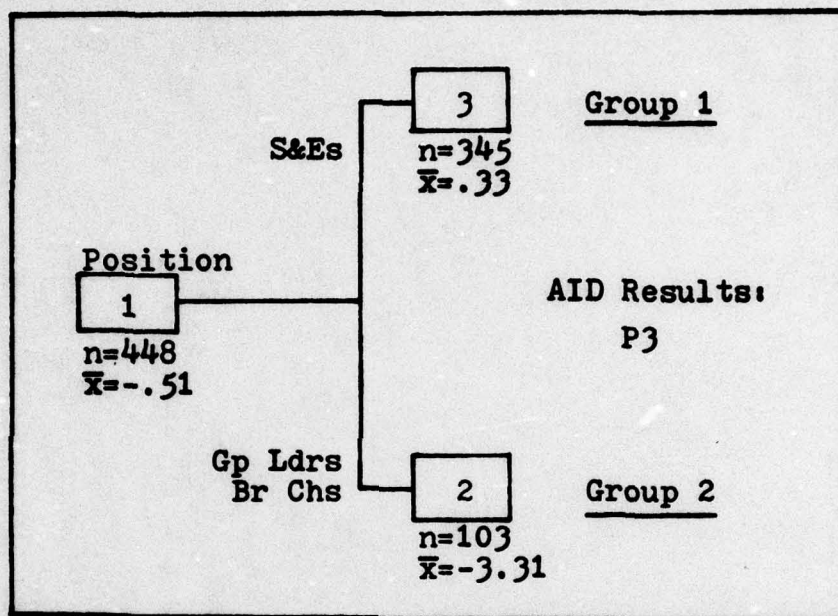


Figure F-9. Productivity Factor Three:
AID Tree*

(*See NOTE on Figure F-5)

Table F-7
Differences Among Divisions on Productivity
Factors: Homogeneous Groups

Group	Short Name	Factor	Mean and (Std Dev)								F-Value 1978 1979
			FX		FB		FE		FG		
			1978	1979	1978	1979	1978	1979	1979		
1	Gp Ldrs, Br Chs & Other	P1	.69 (1.38) n=17	.23 (.97) n=11	.41 (1.23) n=18	-.18 (.37) n=10	.62 (1.58) n=15	-.09 (.42) n=15	-.11 (.47) n=17	.20 .83	
2	S&Es		-.26 (.49) n=47	-.24 (.62) n=53	-.12 (.94) n=68	-.11 (1.38) n=48	.24 (1.24) n=39	.20 (.92) n=34	-.06 (.91) n=55	3.27**1.14	
1	PhD's	P2	.77 (1.33) n=8	.91 (1.37) n=9	1.91 (1.92) n=11	1.60 (1.07) n=6	.77 (.81) n=4	1.40 (.76) n=3	-.30 (.24) n=6	1.45 3.68**	
2	Non-PhD's, GS-13s and above		-.34 (.58) n=35	-.08 (.66) n=33	-.12 (.95) n=44	.05 (1.15) n=32	.27 (1.17) n=27	-.08 (.64) n=26	.23 (1.03) n=27	3.41** .62	
3	Non-PhD's, GS-12 and below		-.34 (.43) n=22	-.29 (.55) n=22	-.31 (.47) n=31	.19 (1.46) n=20	-.08 (1.05) n=23	-.28 (.57) n=20	-.42 (.45) n=39	1.00 2.74*	
1	Gp Ldrs, Br Chs, & Other	P3	-.39 (.46) n=18	-.38 (.40) n=11	-.21 (.89) n=18	-.19 (.73) n=10	-.25 (.74) n=15	-.37 (.31) n=15	-.47 (.36) n=17	.32 .70	
2	S&Es		.05 (.64) n=47	.01 (.51) n=53	.31 (1.90) n=68	.31 (1.12) n=48	.30 (.87) n=39	.04 (.60) n=34	-.32 (.39) n=55	.53 7.04**	
*p=.05 **p=.04 ***p=.0002											

Appendix G

Data Analysis for Hierarchical Groups

Table G-1
Differences Among Divisions on Hopcock Scores:
Hierarchical Groups

Group	Short Name	Mean and (Std Dev)								F-Value	
		FX		FB		FE		FG	1978	1979	
		1978	1979	1978	1979	1978	1979	1979	1978	1979	
1	Secretaries	18.50 (2.38) n=4	18.80 (1.30) n=5	17.81 (3.80) n=16	17.53 (3.11) n=15	16.70 (4.24) n=10	17.22 (3.49) n=9	19.44 (3.24) n=16	.41	1.42	
2	Technicians	19.58 (3.78) n=19	20.33 (2.97) n=15	18.17 (4.66) n=23	18.84 (4.25) n=25	19.29 (4.54) n=17	21.06 (2.62) n=16	19.33 (3.08) n=16	.43	1.27	
3	S&Es	18.63 (3.49) n=57	18.86 (3.23) n=52	19.35 (3.04) n=82	19.06 (3.30) n=52	17.83 (3.83) n=47	18.41 (4.05) n=39	18.76 (3.92) n=72	3.12*	.25	
4	Group Leaders	19.06 (3.30) n=17	18.25 (4.37) n=12	19.27 (2.10) n=11	18.80 (2.20) n=10	18.78 (3.15) n=9	18.22 (2.44) n=9	18.80 (3.46) n=10	.07	.10	
5	Branch Chiefs	22.00 (5.66) n=2	18.00 (3.00) n=3	20.71 (3.09) n=7	24.25 (2.36) n=4	20.00 (2.16) n=4	21.00 (1.83) n=4	20.60 (1.82) n=5	.26	3.68**	
*p=.05 **p=.04											

Table G-2
Differences Among Divisions on Patchen Scores:
Hierarchical Groups

Group	Short Name	Mean and (Std Dev)								F-Value	
		FX		FB		FE		FG	1978	1979	
		1978	1979	1978	1979	1978	1979	1979	1978	1979	
1	Secretaries	14.50 (1.29) n=4	16.00 (1.26) n=6	13.23 (3.47) n=17	13.07 (3.27) n=14	13.10 (4.07) n=10	14.40 (3.47) n=10	15.50 (2.45) n=16	.25	2.34	
2	Technicians	15.06 (2.88) n=18	14.20 (3.26) n=15	13.29 (3.51) n=21	14.64 (3.20) n=25	13.94 (3.42) n=16	14.81 (2.76) n=16	14.33 (2.80) n=6	.97	.15	
3	S&Es	13.44 (2.88) n=57	13.66 (3.19) n=58	13.72 (3.33) n=81	14.13 (3.05) n=52	14.38 (3.27) n=47	14.21 (3.20) n=39	13.39 (3.24) n=72	1.19	.84	
4	Group Leaders	15.59 (2.74) n=17	15.18 (2.36) n=11	15.18 (3.57) n=11	14.80 (3.39) n=10	17.44 (1.88) n=9	16.33 (2.35) n=9	14.90 (2.02) n=10	1.77	.69	
5	Branch Chiefs	16.50 (2.12) n=2	16.33 (.58) n=3	16.57 (2.76) n=7	15.75 (3.30) n=4	16.75 (1.50) n=4	15.75 (1.89) n=4	16.60 (1.52) n=5	.01	.32	

Table G-3
Differences Among Divisions on Organizational
Climate Factor One: Hierarchical Groups

Group	Short Name	Mean and (Std Dev)										F-Value	
		FX		FB		FE		FG		1978	1979		
		1978	1979	1978	1979	1978	1979	1978	1979	1978	1979		
1	Secretaries	-.39 (.29) n=4	-.32 (.60) n=4	-.69 (1.11) n=14	-.29 (1.01) n=15	-.79 (1.15) n=8	-.26 (.94) n=10	-.08 (.82) n=14	.19	.15			
2	Technicians	.05 (.64) n=15	.02 (.62) n=15	-.42 (1.47) n=22	-.34 (1.16) n=24	-.22 (1.08) n=14	-.27 (.84) n=16	.16 (.64) n=6	.82	1.02			
3	S&Es	.04 (.89) n=56	-.35 (1.14) n=57	.21 (.87) n=79	.24 (.91) n=45	.21 (.98) n=42	.04 (.95) n=37	-.10 (1.06) n=69	.71	2.90*			
4	Group Leaders	.70 (.99) n=16	.34 (1.17) n=12	.68 (.93) n=11	-.11 (.59) n=10	.46 (.88) n=8	.75 (1.02) n=9	-.09 (.68) n=10	.19	1.87			
5	Branch Chiefs	-.32 (.10) n=2	.22 (.57) n=2	.54 (.61) n=7	.18 (.27) n=2	.45 (.52) n=4	.05 (.67) n=4	.46 (.52) n=4	1.95	.31			
*p= .04													

Table G-4
Differences Among Divisions on Organizational
Climate Factor Two: Hierarchical Groups

Group	Short Name	Mean and (Std Dev)								F-Value	
		FX		FB		FE		FG			
		1978	1979	1978	1979	1978	1979	1979	1979	1978	1979
1	Secretaries	-.62 (.38) n=4	-.32 (.72) n=4	.05 (1.18) n=14	-.19 (1.08) n=15	-.12 (1.03) n=8	-.51 (.85) n=10	-.18 (.80) n=14	.61	.31	
2	Technicians	.22 (.98) n=15	-.28 (1.44) n=15	-.55 (1.35) n=22	-.53 (1.02) n=24	.23 (.87) n=14	.40 (.76) n=16	-.09 (.23) n=6	2.01	1.99	
3	S&Es	.16 (1.05) n=56	.18 (.99) n=57	.07 (.98) n=79	.28 (.94) n=45	-.10 (1.01) n=42	-.19 (1.14) n=37	.11 (.94) n=69	.82	1.64	
4	Group Leaders	.04 (1.11) n=16	.20 (1.16) n=12	-.18 (.88) n=11	.16 (.69) n=10	-.18 (.97) n=8	-.12 (.97) n=9	-.08 (.80) n=10	.08	.31	
5	Branch Chiefs	.53 (.81) n=2	-.44 (.34) n=2	.62 (.89) n=7	-.04 (.65) n=2	.52 (.42) n=4	.27 (.63) n=4	.06 (.46) n=4	.03	1.83	

Table G-5
Differences Among Divisions on Organizational
Climate Factor Three: Hierarchical Groups

Group	Short Name	Mean and (Std Dev)										F-Value	
		FX		FB		FE		FG		1978	1979		
		1978	1979	1978	1979	1978	1979	1978	1979	1978	1979		
1	Secretaries	.89 (.87) n=4	.71 (.31) n=4	.19 (1.21) n=14	.52 (1.00) n=15	-.05 (.91) n=8	-.25 (.87) n=10	.66 (.73) n=14		1.01	2.70*		
2	Technicians	.20 (1.02) n=15	.20 (.84) n=15	.32 (.81) n=22	.24 (.84) n=24	.00 (1.03) n=14	.29 (1.14) n=16	1.01 (1.32) n=6		.34	.93		
3	S&Es	-.27 (1.01) n=56	-.41 (1.02) n=57	.04 (1.01) n=79	-.11 (.84) n=45	-.26 (1.12) n=42	-.23 (1.05) n=37	-.05 (.91) n=69		1.89	1.57		
4	Group Leaders	-.63 (.93) n=16	-.50 (1.06) n=12	-.31 (1.02) n=11	.48 (.94) n=10	-.30 (.91) n=8	-.13 (1.01) n=9	-.33 (.84) n=10		.50	2.07		
5	Branch Chiefs	.62 (1.19) n=2	.17 (.46) n=2	.13 (.99) n=7	.75 (.25) n=2	.60 (.86) n=4	.67 (.98) n=4	-.06 (.78) n=4		.38	.81		

*p=.059

Table G-6
Differences Among Divisions on Organizational
Climate Factor Four: Hierarchical Groups

Group	Short Name	Mean and (Std Dev)								F-Value	
		FX		FB		FE		FG			
		1978	1979	1978	1979	1978	1979	1978	1979	1978	1979
1	Secretaries	.80 (.80)(1.27) n=4	-.27 (.71) n=4	.20 (1.05) n=14	-.12 (.71) n=15	-.10 (1.31) n=8	.36 (1.07) n=10	-.46 (.68) n=14	.86	1.83	
2	Technicians	.16 (1.15)(1.04) n=15	.09 (.88) n=15	.08 (.93) n=22	.12 (.88) n=24	-.18 (.66) n=14	.29 (.90) n=16	.01 (1.13) n=6	.71	.15	
3	S&Es	-.34 (.80)(1.02) n=56	-.21 (.89) n=57	-.19 (1.04) n=79	-.03 (.89) n=45	-.37 (1.11) n=42	.19 (1.20) n=37	-.07 (.96) n=69	.62	1.20	
4	Group Leaders	.02 (.88)(1.08) n=16	-.34 (.58) n=12	.38 (.66) n=11	.55 (.58) n=10	.09 (.67) n=8	.52 (.53) n=9	.98 (1.10) n=10	.70	4.37**	
5	Branch Chiefs	.61 (.59)(.87) n=2	.18 (.22) n=2	.52 (.62) n=7	.99 (.22) n=2	.35 (.72) n=4	.79 (.84) n=4	1.26 (.72) n=4	.13	.75	
**p=.01											

Table G-7
Differences Among Divisions on Organizational
Climate Factor Five: Hierarchical Groups

Group	Short Name	Mean and (Std Dev)								F-Value	
		FX		FB		FE		FG			
		1978	1979	1978	1979	1978	1979	1978	1979	1978	1979
1	Secretaries	.16 (1.22) n=4	.69 (.60) n=4	-.27 (.88) n=14	.28 (.92) n=15	.52 (1.54) n=8	.48 (1.13) n=10	.67 (.44) n=14	1.22	.64	
2	Technicians	.61 (.96) n=15	.34 (1.04) n=15	.16 (1.08) n=22	-.10 (1.19) n=24	.45 (.75) n=14	.34 (.74) n=16	.04 (.81) n=6	.70	.82	
3	S&Es	-.19 (1.05) n=56	-.16 (1.04) n=57	-.37 (.96) n=79	-.33 (.96) n=45	.07 (1.04) n=42	.08 (1.05) n=37	-.06 (.97) n=69	2.60	1.30	
4	Group Leaders	.01 (.72) n=16	.24 (.79) n=12	-.62 (1.30) n=11	-.16 (1.08) n=10	.14 (.56) n=8	-.01 (.84) n=9	-.34 (.96) n=10	2.07	.78	
5	Branch Chiefs	-1.25 (.20) n=2	.13 (.59) n=2	.48 (.89) n=7	.11 (.88) n=2	.63 (.34) n=4	.29 (.75) n=4	.39 (.27) n=4	5.29**	1.33	
**p=.03											

VITA

Roger G. DeKok was born on 10 January 1947 in Kenosha, Wisconsin, where he graduated from High School in 1964. He attended the University of Wisconsin, Madison, where he received a Bachelor of Arts degree in mathematics in 1968. At that time he was commissioned as a Second Lieutenant in the United States Air Force.

Major DeKok has served in a variety of space system assignments during his Air Force career. His operational assignments have been at satellite and missile tracking sensors in Turkey and Florida. His staff assignments have been at Headquarters, North American Air Defense Command, Colorado Springs (1971-1974); Headquarters, United States Air Force, Washington, D.C. (1974-1976); and Headquarters, Aerospace Defense Command, Colorado Springs (1976-1978). He entered the School of Engineering, Air Force Institute of Technology, Wright-Patterson Air Force Base, Ohio in 1978.

Major DeKok is married to the former Carolyn Flinkow of Chester, Virginia. They have two children: Kristen and Ryan.

Permanent Address: 4512 79th Street
Kenosha, Wisconsin
53140